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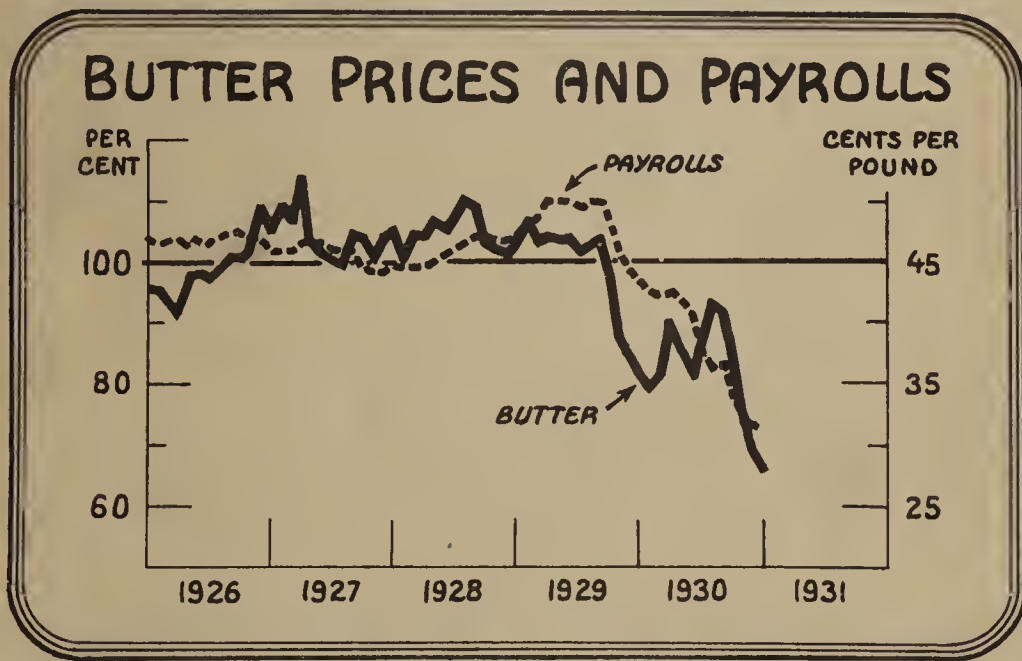
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UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

THE OUTLOOK FOR THE DAIRY INDUSTRY AND ESSENTIALS OF A NATIONAL DAIRY PROGRAM



BUTTER PRICES ARE GREATLY
INFLUENCED BY CHANGES IN PAYROLLS

WASHINGTON, D. C.
MARCH, 1931

FOREWORD

The dairy industry is sharing in the worldwide agricultural depression. Within the last eighteen months butter prices have been cut almost in two and prices of cheese and fluid milk have also slumped. The worldwide business depression, with the accompanying reduction in buying power, no doubt accounts for much of the price decline. But changes in production and large supplies at home and abroad have also played a part. As business conditions improve, the demand for dairy products no doubt will also improve. Relatively low prices of dairy feeds, lower returns for competing products and other influences, however, indicate that the production of dairy products will be maintained at high levels. It is likely, therefore, that the dairy industry will find it necessary to operate on a somewhat lower price level for some time.

The upheaval in business and agriculture the world over is profoundly affecting the dairy industry. Just what is ahead is not easy to foretell. The industry in the United States, however, is in a strategic position to adjust itself to changing conditions. What the dairy industry needs is a national program embodying objectives on which all can unite in the best interest of the industry.

Some of the essential in such a program are quite apparent. In the production field - increasing efficiency, control of animal diseases and economic adjustments to changing conditions stand out as pivotal. In the field of marketing - the broadening of the demand for dairy products and greater skill in merchandising them are essential. In the field of national and state policies - adjustments in tariffs, taxes, land policies and the like, will contribute to the welfare of the industry.

The United States Department of Agriculture, cooperating with the Land Grant Colleges and other state institutions can make a weighty contribution to the development of this program - the Bureau of Dairy Industry through its work in herd improvement, feeding, and utilization of dairy products - the Bureau of Animal Industry through its disease control work - and the Bureau of Agricultural Economics through its economic information, economic research, and service activities. A closer coordination of the economic and technical-production activities of the several bureaus of the Department of Agriculture, strengthened and pointed to the broad national needs of the industry, will assist the dairy industry to realize this objective.

Nils A. Olsen,
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UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Agricultural Economics
Washington

THE OUTLOOK FOR THE DAIRY INDUSTRY

The drastic decline in prices of dairy products during the last 18 months raises the problems of how dairy-men will react to the present situation and what will be the most satisfactory program for them to follow in light of present and probable future conditions. Butterfat prices are 46 per cent lower than they were two years ago. On January 15, 1931 the index of farm prices of dairy products stood at 107 per cent of the 1910-1914 average whereas the index of prices paid by farmers for the things they buy averaged 147 per cent of the 1910-1914 average. On the other hand the general index of farm prices was only 94 and that of grain prices was 77. The dairy farmer in gauging his production program must consider, among other things, the probable course of prices of dairy products and compare incomes to be derived from dairying with incomes from other enterprises.

Cattle numbers in the United States started on the upward phase of their cycle in 1929, but the increase to the beginning of 1931 was small. Further increases in cattle numbers are to be expected in the next few years, and some further increase in numbers of milk cows is also likely. Lower prices for cows and increasing numbers will make it comparatively easy to expand dairy production. Moreover, feed prices are low despite the effects of the drought. Low feed prices encourage feeding and if supplies are more nearly normal next season and incomes from grain production continue low the prospects are for comparatively heavy feeding, especially in sections having locally produced supplies. The outlook therefore, is for continued high production.

The demand for dairy products has had an upward trend over a period of years, but the reduced consumer incomes as a result of the present depression have restricted demand temporarily. Since surpluses go mostly into butter the restriction in demand has fallen particularly heavily upon the butter market. As usual in such periods, butter prices have fallen most, but cheese prices have also fallen and fluid milk prices have been reduced in some communities.

The decline in butter prices to about the world level has reemphasized the foreign dairy situation. Are domestic prices to remain low compared with foreign prices? Will the United States become an important exporter? Europe has been the only foreign market able to absorb any large amounts of butter. Supplies going to European markets have expanded rapidly and appear to have kept fully abreast of demand. In fact foreign supplies have been pressing upon the United States market for most of the past decade, and only repeated increases in the tariff have kept imports in check. The United States would therefore meet severe competition in foreign butter markets. On the other hand domestic demand can be expected to improve materially as business recovers and this will take care of a volume of production which would be in excess of present market requirements. It is not evident that the United States will become a regular butter exporting country of importance even though exports may become significant during our heavy production season,

which comes when supplies from Southern Hemisphere countries are low. Other products, as condensed and powdered milk, may be exported in larger volume. Reduced imports of some products as a result of tariff increases may make it possible to manufacture more dairy products domestically which heretofore have been imported.

In judging price prospects it will be well for the industry to recognize that dairy production is likely to continue high. The principal cause of the present low prices of dairy products, however, is the reduced buying power of consumers resulting from the present business depression. With a recovery in business an increased demand and some improvement in prices is to be expected.

Low prices discourage production and cause many drastically to quit curtail production. Dairy producers should consider carefully the incomes from dairying in comparison with possible alternative enterprises. Where labor is adequate and feeds are cheap, dairying will probably continue to be a strong competitor among farm enterprises.

Prices of dairy cows

The price of dairy cows has an important influence on subsequent numbers. When prices are high, as they were in 1929, farmers tend to save a larger proportion of their heifer calves and develop them for dairy purposes but low prices of dairy cows discourage the raising of calves. An understanding of the probable future trend of cow prices can be used as a more satisfactory guide for increasing or decreasing the raising of calves. Also, it should be an important factor in determining when one should go into dairying or make changes in the dairy herd. Frequently cows are purchased at high prices when the buyer could equally as well have delayed the purchase a year or so and have bought at much lower prices. Areas in which dairying is introduced by the purchase of cows at peak prices have an obstacle to success in dairying. On the other hand farmers frequently overlook the opportunity of making desirable additions to or changes in their herds when prices are low.

An examination of prices of milk cows over a series of years shows three important facts. (Fig. 1.) First, the price of milk cows rose rapidly from 1905 to 1920 and the average of prices since the World War has been higher than it was prior to the war, largely because of the rise in the general level of commodity prices. Second, changes in the price of milk cows are closely related to changes in the price of other cattle. This is partly because the milk cow has some value for beef, and partly because the total production of milk is influenced by the total number of cattle on farms, since some cows are kept primarily for milk purposes at one time and for beef purposes at other times. The fact that milk cows are all two years old or over causes the average of their prices to be higher than the average of prices of other cattle, which include calves. The increase in the spread between these two classes of cattle apparently is to be explained primarily on the basis of a lowering in the average age of cattle other than milk cows. Third, prices of milk cows have distinct cyclical movements. Years of peak prices were 1871, 1884, 1900, 1920, and 1929. Rather long periods of generally low prices followed each of these peaks. The cattle-price cycle can be observed more clearly when the prices are adjusted so as to eliminate the influence of the general level of commodity prices.

After adjusting prices of milk cows and other cattle for changes in the general price level it is found that the years of peak cattle prices were 1871, 1885, 1899, 1915, and 1930. (Fig. 2). These peaks were from 14 to 16 years apart. In each cycle there tends to be a short period in which prices rise to a sharp peak and then fall sharply, and this is followed by a long period of low prices. There was a marked decline in prices during 1930 but January 1, 1931 prices were still well above the price at the low point of the previous cycles. During the last three cycles dairy-cattle prices have declined through periods ranging from five to ten years. Even though the sharp drop in prices which has already occurred might furnish some temporary check to the expansion in cattle numbers, the course of cattle prices is likely to continue generally downward, as compared with prices of other commodities, for several years.

Prices of milk cows in New York State and in Wisconsin and of steer prices at Chicago have cycles corresponding to those observed in the prices of milk cows and other cattle for the United States. (Fig. 3). Since milk cows in these States are so uniformly of dairy type, this emphasizes the relation between prices of beef cattle and dairy cows. The fact that the upward swing in beef cattle production did not begin until 1928, therefore, is of considerable importance with respect to the course of dairy-cattle prices for the next few years. Prices of milk cows appear likely to continue downward for several years.

The year-to-year variations in prices of milk cows in New York and Wisconsin differ considerably. In 1930 prices of butter and cheese fell materially, whereas prices of fluid milk were relatively stable. This is probably the reason why prices of milk cows declined much more in Wisconsin in 1930 than they did in New York.

Numbers of dairy cattle

Recently milk cows have constituted about 40 per cent of all cattle on farms. The trend in dairy cow numbers has been upward since 1900, whereas total cattle numbers have had only a slight upward trend. (Fig. 4). Estimates of the number of milk cows on farms have increased every year since 1900 except for the years 1926 and 1927. Some of the increase in the estimates of the number of dairy cows may be due to changes in classifications, but there is no doubt that the proportion of dairy cows has increased materially. The pronounced cycles in total cattle numbers correspond in general to the cycles in prices of milk cows and cattle. Since farmers check their marketings when they begin to build up their herds, the peak in cattle prices tends to occur somewhat later than the low point in cattle numbers. Conversely when the producers decrease their cattle numbers they increase marketings and this causes the low point in cattle prices to follow the high point in cattle numbers. To illustrate: In the last cycle, cattle numbers reached a low point in 1912 and cattle prices reached a high point in 1915 whereas the high point in cattle numbers came in 1918 and the low point in cattle prices in 1925. In the present cycle cattle numbers were at a low point in 1928 and cattle prices reached the peak in late 1929. On January 1, 1931, the number of all cattle on farms was estimated at 59,000,000 head or 5 per cent higher than on January 1, 1928. Any liquidation in cattle numbers following present low prices would probably be of minor importance since we are still near the bottom of the cycle in cattle numbers.

The number of heifers being kept for milk cows also gives an indication of the probable changes in numbers of milk cows over the next two or three years and indicates the reactions of farmers to recent prices. On January 1, 1931, there were 20 heifers, one and two years old, per 100 milk cows. This was the same proportion that existed from 1929 to 1930 when the number of milk cows increased rapidly. From the standpoint of the number of heifers available, therefore, there is the possibility of a continued increase in the number of milk cows in 1931 (Fig. 5). The opposite situation exists with respect to the number of heifers under one year old being kept for milk. Estimates of heifer calves of this age being kept for milk have been made since January 1, 1925. On January 1, 1931, there were 20 heifers under one year old per 100 milk cows. This was considerably less than the number in this age group on January 1, 1930, and was the lowest ratio for any of the six years for which the data have been collected. The actual number of heifers in this age group decreased as well as the ratio of these heifers to milk cows. This decrease points to a smaller number to come into milk in 1932 than in 1930 or than there are likely to be in 1931.

The number of milk cows for the United States as a whole decreased in 1926 and 1927, but has increased each year since then so that the trend from 1920 to 1931 has been upward. The trends by sections of the country, however, are quite different. (Fig. 6). These different trends reflect the relative advantage of the several sections in dairy production and the advantage of dairying as compared with other farm enterprises within each section.

The greatest proportional increase since 1920 in numbers of milk cows came in the 11 western States. Numbers in the three Pacific coast States increased rapidly from 1920 to 1924, then held steady until 1927, when they started upward again. In the other eight western States there was merely a slowing up in the rate of increase from 1925 to 1928, but since 1929 there has again been a slowing up in the rate of increase. The number of heifers one to two years old being kept for milk is high in the western States, indicating that farmers intend to continue the expansion of dairying in this section.

A material expansion in numbers of milk cows has also occurred in the west north central States. The greatest expansion took place from 1920 to 1926 as a result of a continued period of low prices for grains and meat animals and comparatively favorable butter prices. As incomes from other enterprises became more favorable there was a moderate decrease in the number of milk cows in this section, but since 1929 the number has been increasing again. In the eastern corn belt the trend in numbers of milk cows has been only slightly upward for the period since 1920 as a whole, but it has been sharply upward since 1929. With grain prices comparatively low and incomes from cash crops reduced, it is to be expected that dairying in this section will increase.

In the south central States milk cow numbers decreased from 1920 until 1926 reflecting the high prices for cotton during much of the period. Since 1926 dairying has increased in these States and as a result of present low prices for cotton and efforts to diversify southern agriculture to a somewhat greater extent than it is at present, there is a strong probability that dairying in these States will continue to increase in districts able to supply adequate feeds.

In the Atlantic seaboard States the trend in numbers of milk cows was downward from 1920 to 1926. This probably reflected the decline in prices of fluid milk in 1921 and 1922, the growing competition of other sections in butter production and the high costs of transportation on shipped in feed. In addition it reflects a more general decline in the agriculture of the eastern States. Since 1927 milk cow numbers have been increasing moderately. With the prospect for continued severe competition from western States in the production of butter and cheese, it is likely that dairying in the extreme eastern States will be held essentially in line with requirements of the fluid milk trade. In the South Atlantic States, however, the increase may be comparatively greater along with developments in the agriculture of the cotton States, and because of growing industrialization which will increase local market demands. However, dairying in the South Atlantic States is little developed as yet.

For the country as a whole it is to be expected that the number of milk cows will continue upward for the next few years, but the rate of increase may not be as rapid as it was in 1929 and 1930.

Production and Sale of Milk

The quantity of milk and butterfat appearing in commercial channels depends not only on the number of milk cows on farms, but on the quantity of milk produced per cow and on the proportion of the total production that is utilized on farms. The production of milk per cow has been increasing gradually for a long period and will probably continue to show an upward trend. Recently the upward trend has been most marked in parts of the Western Corn Belt. As many heifers of dairy breeds are still being raised, this upward trend will probably continue to be locally important for several years more.

The quantity of milk available for human use depends in part upon the number of calves allowed to suck. In this country about 9,000,000 cows are kept for beef production only. These are usually allowed to raise their calves, but many of them are on farms and can be milked whenever the price of butterfat is sufficiently high or whenever the returns from other farm products are so low that farmers feel compelled to milk the cows to secure the additional revenue. In addition, there are nearly 22,000,000 cows which are milked for at least a part of each year. Many of these have calves running with them for a portion of each season and in many cases the cows are only partially milked by hand, the remainder of the milk being sucked by the calves. The February, 1931, reports from special dairy correspondents of the Bureau of Agricultural Economics would seem to indicate that at that time about 66 per cent of the cows were milked entirely by hand or machine, 5 per cent were partially milked by hand and partly sucked by calves, and 4 per cent were sucked by calves and not milked. The remaining 25 per cent were reported as dry.

The practice of letting the calf suck part of the milk is particularly prevalent in the South where many of the farmers have only one or two cows. The practice of letting the calves suck all the milk for a time is commonest in herds of 2 to 15 cows. This is a common practice both in sections that have cows of a dual-purpose type and in strictly dairy sections where veal calves are fattened on whole milk prior to sale. It is least common where herds are large and where skimmed milk is available for feeding, although even in such sections, it is not uncommon to let the calves suck for the first few days.

In recent months there appears to be an increasing proportion of cows being milked, particularly in the Corn Belt States. The high level of production of milk per cow at present is due in part to the low price of grain, which encourages feeding, especially in sections that have a surplus of grain to sell. As production of grain was greatly reduced by the drought last summer, a substantial increase in production during 1931 seems probable as there is nothing as yet to indicate more than local scarcity of feed for some little time to come. The probability, therefore, is that farmers will continue to feed cows fairly heavily unless prices of butter and other dairy products drop so low as to make feeding unprofitable, or the price of grain rises.

Last summer production of milk was sharply reduced by very poor pastures. The hay shortage was also acute. Many cows are still on short rations in the sections most affected by the drought. For this reason the full effect of the increasing number of cows has not yet been felt. With prices now favorable to feeding, with an increase of about $2\frac{1}{2}$ per cent above last year in the number of milk cows on farms, and with a high percentage of cows being milked, it is likely that a high level of milk production will continue at least through the pasturage season. Production next fall will be dependent on prices at that time, but the chances would seem to favor a continuation of fairly heavy production. It must be recognized, however, that in many sections the price of butterfat is already down to 18 or 20 cents and can not go much lower without causing a substantial decrease in production. Even in some of the fluid-milk areas a tendency toward less extensive feeding and toward the feeding of more calves is already reported.

The proportion of milk and butterfat sold from farms is also dependent to some extent on prices. Normally about 3 per cent of the whole milk produced is fed to calves, about 12 per cent is used for farm butter, and about 11 per cent is used for consumption of fluid milk on farms.

Output of Dairy Products

Dairy production generally has had a marked upward trend during the last 30 to 50 years as indicated by estimates of production in census years. (Fig. 8 and 9 incl.) Milk production has increased from slightly over 5,000,000 gallons in 1889 to about 9,000,000 gallons in 1924 with the greatest absolute increases in the periods 1889 to 1899 and 1919 to 1924. Total butter production has increased steadily from 1849 to 1924, and, judging from data on factory production, it probably increased until 1927. It is possible that 1929 may show a slight decrease. Production of cheese has increased during the period 1879 to 1929, the greatest absolute increase being in the years 1921 to 1923 and 1927 to 1929. Total production of condensed and evaporated milk increased from 1899 to 1919, with a large increase in the period 1914 to 1919. Production dropped sharply in the period 1919 to 1923 then increased to 1927 but dropped again to the pre-war level in 1929.

The annual estimates of the Bureau of Agricultural Economics since 1918 also indicate that the production of butter, cheese, condensed and evaporated milk, and ice cream has had an upward trend. On the basis of these annual estimates, production of factory butter has increased during the period 1918 to 1929, with 1930 showing a decrease; factory cheese production has increased to 1929, 1930 showing a decrease; and ice cream and condensed and evaporated milk production have likewise increased to 1929. (Fig. 10 to 14 incl.) Production estimates for ice cream and condensed and evaporated milk in 1930 are not yet available. Annual estimates show that butter production was less in 1930 than in 1929, but monthly data show that production of butter in January, May, November, and December of 1930 was higher than in the corresponding months of 1929. Indications are, therefore, that 1930 production of butter, and probably the production of other dairy products also, would have exceeded the production in 1929 had it not been for the curtailment caused by the drought.

The upward trend in the production of dairy products has been associated with the upward trend in milk-cow numbers, though the increase in production of dairy products has been at a more rapid rate, indicating an increasing output per cow. Deviations from trend in the output of dairy products are probably attributable mainly to changes in feeding practice. Since cow numbers are on the upward phase of a cycle, the prospect is for a continued increase in the output of dairy products.

Although the output of dairy products generally has shown an upward trend, variations are apparent in the production of specific products. Of the various types of cheese, the production of American whole-milk cheese is by far the most important and dominates variations in total cheese production. (Fig. 11) The production of cottage and cream types of cheese have had the same upward trend since 1913 as has American. (Fig. 12) On the other hand, brick type cheese has had a steady downward trend in production during this period, and the production of Italian types had a downward trend to 1925 with a marked upward trend in the period 1925 to 1929. The production of Swiss-type cheese had an upward trend to 1923 and a downward trend from 1923 to 1929.

The production of evaporated whole milk has shown an upward trend since 1918, as has the production of evaporated and condensed skimmed milk, while the production of condensed whole milk has been downward (Fig. 13).

Receipts of fluid milk and cream at New York, Philadelphia, and Boston have had upward trends, but in 1930 receipts at New York decreased materially and receipts at Philadelphia decreased slightly. Data for Boston are incomplete, but receipts in 1930 were well above those in 1926 (Fig. 15). The decrease in receipts at New York and Philadelphia are probably to be explained mainly by decreased demand accompanying the decreased consumer incomes.

The Long-Time Trend of Prices

During the last year prices of dairy products have declined sharply. This decline has been the most severe that has occurred since 1921, and in comparison with it the decline in retail prices of commodities farmers buy has been slight. (Fig. 16). Price declines such as occurred in 1930 emphasize the necessity of considering the probable future course of prices in adjusting dairy production.

Ordinarily adjustments in dairy production must be gradual if losses are to be avoided. For this reason it is necessary for dairy producers to consider the probable course of prices for a period of years ahead.

A review of price movements since 1840 gives some basis for a conclusion as to the long-time trend of prices. The long-time trends in the prices of butter and cheese are similar to those in the level of commodity prices in general. (Fig. 17). During the Civil War period commodity prices rose to high levels and this was associated with a rise in prices of both butter and cheese. Following that war commodity prices fell sharply until 1879 and then declined more gradually until 1897. Prices of butter and cheese had similar movements through this period. From 1897 to the World War period the trends of these prices were upward, and during the war period prices of butter and cheese, as of other commodities, rose to high levels. In 1920 drastic declines occurred in the prices of butter and cheese and in the general level of commodity prices. Since 1920 the trend of commodity prices has been downward and there is much to indicate that this general trend will not change in the near future. The sharp declines in prices of dairy products and in commodity prices generally which occurred in 1930, however, were accentuated by the world-wide business depression. When business recovers, some recovery in commodity prices is to be expected, but it is unlikely that this rise will carry commodity prices to the levels prevailing from 1925 to 1929. If commodity price levels continue to have a longtime downward trend as they did for a number of years following the Civil War, this will influence the trends in prices of dairy products.

Effect of Consumers' Incomes

For short periods incomes of consumers have a strong influence on the prices of butter. This is shown in Figure 18 in which a comparison of the price of butter with an index of payrolls by months from 1919 to date is shown. The moderate decrease in payrolls which resulted from the business recession in 1924, and the severe declines in payrolls which accompanied the depressions of 1921 and 1929-30, had corresponding influences on the price of butter. When the recovery in business gets under way and payrolls increase, it is to be expected that prices of butter will improve even though butter production should make some moderate increase.

Prices of Dairy Products Compared With Prices of Feed and Prices of Meat Animals

Changes in the price relationship between feed and dairy products affect the profitableness of dairy production. Changes in the relationship between prices of dairy products and meat animals reflect the relative profitableness of dairying as compared with meat production. During the World War farm prices of grain and meat animals rose earlier and more rapidly than did prices of dairy products, and butter production remained constant. (Fig. 19)

In 1919 and 1920 when the decline in prices occurred, farm prices of meat animals and grain declined earlier and fell further than did the prices of dairy products. For the three years, 1921 to 1923, prices of dairy products were low as compared with prices in the war years, but were high as compared with prices of grain and meat animals. During this period dairy production increased rapidly. The price declines in 1929 and 1930 were somewhat similar to those in 1920. Grain prices declined earlier and further than prices of dairy products.

For the next few years it is probable that even though prices of dairy products continue low as compared with prices from 1925 to 1929, they will still be relatively high as compared with farm prices of grain.

The number of pounds of butter equal in value to 100 pounds of live steer and 100 pounds of live hog are shown in Figure 20. The cyclical movement in the number of pounds of butter equal in value to 100 pounds of steer is explained almost entirely by the cycle in steer prices. From 1921 to 1926 steer prices were low as compared with butter, but in 1928 steer prices rose to unusually high levels in comparison with butter prices. As cattle numbers are now increasing this incentive to shift from dairy to beef production is not likely to continue.

Retail Prices of Dairy Products

The retail prices of butter, cheese, and fluid milk have behaved very differently in the present depression and their movements have been quite different for several years. (Fig. 21) In the general upward price movement which occurred from 1913 to 1920 the trends of retail prices of these three products were similar. For 1920 the index number for the retail price of milk was 188, butter 183, and cheese 188, in comparison with 100 for 1913.

When retail prices declined during the deflation period of 1920 and 1921, prices of butter and cheese declined first and fell farther than did prices of fluid milk. Cheese prices recovered in 1922 and continued high, as compared with fluid milk prices, until the latter part of 1930. Retail prices of butter have remained low as compared with prices of milk. During the seven years 1923 to 1930 the index of retail prices of fluid milk fluctuated between 152 and 162 per cent of the 1913 level while the index of butter prices fluctuated between 111 per cent and 160 per cent, and the index of cheese prices fluctuated between 150 and 177 per cent of the 1913 level. Comparatively high retail prices for meats, increased import duties on foreign cheese, and the sustained business prosperity of the period were probably factors helping to maintain the comparatively high prices for cheese.

When demand is low or production of milk is heavy the surplus goes into manufactured products. Most of the adjustment, therefore, takes place in the prices of manufactured products, primarily butter. Often little change is made in the retail price of fluid milk. Accordingly, the index of butter prices averaged 120 for 1930 whereas the index for fluid milk averaged 157. With a continued decline in butter prices this spread has widened still farther, but recently milk prices have turned downward.

As compared with retail prices of meats and cereals the combined index of retail prices of dairy products has been low since the early part of 1924. (Fig. 22.) This probably reflects in part the expansion in dairying, since the World War, and the high price of meat animals during recent years but there appears to have been a change in the retail margins of these products as compared with the pre-war period. The relation between prices of dairy products and cereals is probably to be explained in part by the influence that branded products have in the index of retail prices of cereal products. A comparison between the retail prices of butter, all dairy products, and all food products, as given in Figure 23, shows that during most of the post-war period prices of dairy products were low in comparison with all items of food, and butter prices were lower than the average of all dairy products.

Trend of Per Capita Consumption of Dairy Products

Per capita consumption of dairy products is materially higher than it was during the World War and the depression period following it. (Fig. 24.) This increase appears most marked when consumption in recent peak years is compared with that in war years or in the depression years of 1920 and 1921. Undoubtedly the period of business prosperity with high consumer incomes in the last decade has contributed to an important degree to this rise, but per capita consumption in recent low years has been substantially higher than in the previous low years. The extent to which per capita consumption was decreased in the war period is not clear. Therefore, it is not certain to what extent the subsequent increase may represent a long-time trend which can be expected to continue and to what extent it may represent a recovery from a subnormal level of consumption.

Effect of incomes on expenditures for dairy products

Expenditures for dairy products increase when consumers' incomes are high and decline when they are low. This is clearly shown in Figures 25 and 26 in which an index of industrial production is compared with estimates of expenditures arrived at by multiplying monthly average retail prices by trade output (apparent consumption) of butter, cheese, and condensed and evaporated milk. Normal seasonal variations have been eliminated from each of the series used in these comparisons.

Fluctuations in expenditures for creamery butter are greater than in expenditures for either cheese or condensed and evaporated milk. In part these differences appear to be due to differences in the amounts of money spent for each of these commodities and in part they appear to be due to differences in consumer's reactions respecting each of the products during periods of prosperity and depression. Total expenditures for butter are much larger than for cheese or condensed and evaporated milk. When their incomes are high consumers increase their expenditures for butter, but when their incomes are low they tend to curtail their expenditures for butter and either reduce their purchases or buy only at lower prices. During the period from 1926 through 1929 expenditures for cheese did not increase proportionately with expenditures for butter and as the depression got under way in 1930 expenditures for cheese did not fall so rapidly as expenditures for butter. Prior to 1926, however, changes in expenditures for these two commodities were similar. In 1921 expenditures for condensed and evaporated milk held rather constant until the depression had passed its low point, and in the present depression expenditures for these products did not start downward so quickly as expenditures for butter. Studies of consumer demand show that consumers with low incomes tend to use more condensed and evaporated milk than do consumers with high incomes. When incomes are reduced, many consumers who in prosperous times use fluid milk and cream, turn to condensed or evaporated milk as a saving.

Effect of prices and incomes on consumption

With the probability of continued large production of milk, the problems of distribution require increasing attention. Part of the problem of distribution consists in the adjustment of prices. If a lowering of prices of certain products, such as milk, has little effect other than to lower the incomes of producers, little or nothing will be gained from such procedure. But if the lowering of milk prices would be likely to lead to increased consumption, it might be advisable to dispose of some of the surplus in this way rather than to dispose of all of the surplus through other channels.

A number of studies have been made which indicate that within ordinary limits the demand for fluid milk is relatively inelastic; that is, prices have little effect on the quantities taken. Possibly, however, such conclusions need modification when applied to periods of reduced consumer incomes.

In a joint study of the Bureau of Agricultural Economics and the New Jersey Agricultural Experiment Station, as well as in several other studies, it was found that the consumption of milk among the different groups varied directly with the size of family incomes. The effect on consumption was more noticeable in the lower than in the higher ranges of consumers' incomes. In a study that the Bureau is now making of consumption in Baltimore it appears that consumption, at least in the form of milk used for children, will show variations according to consumer incomes. These findings suggest that reactions to price may not be the same when incomes of a large proportion of the consumers have been lowered, as they were when incomes were on a higher level. Further evidence on this point is being gathered in a study being made in metropolitan Boston through the cooperation of the New England Dairy and Food Council, the Massachusetts Agricultural College, the Massachusetts State Department of Agriculture, the University of New Hampshire, the New England Research Council, and the Bureau of Agricultural Economics. Observations of the data made prior to the complete tabulations indicate that the consumption of milk has been adversely affected by unemployment, and are suggestive at least that this influence may have been offset to some extent in November and December of 1930 by reductions in the retail price of fluid milk.

These studies have not progressed far enough to furnish a definite conclusion on this problem, but they emphasize the necessity in such time as the present of examining carefully the bases for distribution practices in order that the various avenues of distribution be kept in the most satisfactory balance. In addition, it is necessary to have a more comprehensive understanding of the numerous other factors other than price which influence consumption, if efforts to improve the outlet for dairy products are to be most effective.

Foreign competition and demand

As measured by the volume of imports and exports of dairy products as a whole, production and consumption in the United States are now more closely balanced than is the case in any other important dairy country. Nevertheless each branch of our dairy industry is affected to some extent by foreign competition and demand. From the standpoint of the domestic producer the foreign situation is important from three points of view, as a market for surplus products, as a source of competition in the domestic market, and with the recent tariff, the domestic producer is concerned with the possibility of expanding the production of those dairy products which heretofore have been imported to a large extent. The problems are different for each class of products.

Butter prices in the United States have tended to attract foreign supplies, particularly the highest quality such as Danish and New Zealand butter, throughout most of the post-war period. Prior to the recent marked decline in the domestic prices, pressure of foreign butter supplies has been lessened and imports reduced to their present small volume only by successive increases in the tariff rate.

Imports of cheese of the various foreign types, Italian and Swiss, particularly, have been well maintained despite increased tariff rates and are as yet by far the most stable of our imports of dairy products.

Imports of cream and milk, on the other hand, have been almost excluded by recent upward revisions of the tariff. Cream and milk equivalent in butterfat content to some 20,000,000 pounds of butter were imported annually from 1926 to 1928.

Milk in its condensed, evaporated, and powdered forms, each subject to somewhat different competition, has continued since the war to be exported in an important though decreasing volume. Of powdered milk, the bulk of the domestic product is made from skim milk and apparently this type furnishes the bulk of our exports. Whole-milk powder is imported.

Practically all of the dairy products produced in the United States are now consumed within the country and in addition to the domestic production, foreign supplies equivalent in milk content to something less than 1 per cent of the total national consumption are imported.

Imports of all dairy products were equivalent in 1930 to approximately 933,000,000 pounds of milk and exports to 216,000,000 pounds. The excess of imports over exports thus amounted to 717,000,000 pounds, or less than 1 per cent of the normal yearly production of the United States.

Of the imports in 1930, when reduced to their estimated milk equivalent, cheese accounted for nearly three-fourths (73 per cent), milk and cream 19 per cent, butter 5 per cent, and condensed, evaporated and powdered milk, 3 per cent. Exports from the United States are principally in the form of condensed, evaporated, and powdered milk. These products amounted to about 60 per cent of the total exports in 1930, butter 30 per cent, and cheese 10 per cent.

Since the 80's there has been a rather marked tendency for exports of dairy products to decline and imports to increase. (Fig. 27.) Exports were largest relative to the total domestic output during a short period centering around 1880. Exports of butter reached their peak in 1879-80, when 39,237,000 pounds were exported, and cheese exports were at their maximum in 1880-81 at 147,996,000 pounds. Exportations of both butter and cheese had practically disappeared by 1915 but then recovered rapidly and reached a peak about 1919. Imports of cheese came to exceed exports by 1902-03 and imports of butter exceeded exports by 1913-14. During the war period, exports of condensed milk, butter, and cheese were increased in the years 1915 to 1919 to a volume which (in terms of their milk equivalent) somewhat exceeded the volume reached in the 80's.

In 1919 the excess of imports over exports for all dairy products combined were equivalent to 2,645,000,000 pounds of milk against an excess of exports over imports of 2,164,000,000 pounds for the years 1879 to 1881. The war-time exportation was predominantly of condensed milk.

During most of the last decade the tendency has been persistently in the direction of increasing imports. Increased tariff rates together with recent price declines in the domestic market have now reduced imports to very small amounts.

Prices of manufactured dairy products in the United States are now practically on a world level. The usual margin of domestic over foreign prices of butter entirely disappeared during January and February 1931. (Fig. 28.)

Foreign supplies of butter, as measured by imports into the principal European deficit areas, Great Britain and Germany, and by exports from the 10 most important surplus-producing countries (Denmark, New Zealand, Netherlands, Australia, Russia, Argentina, Sweden, Finland, Latvia and Estonia) have been increasing more rapidly during the last 10 years than has production of butter in the United States. The relatively large increase in foreign market supplies during the last 10 years accounts in part for the continued pressure of supplies of foreign butter upon the markets of the United States. (Figs. 29 and 30.)

Despite the rapid increase in supplies of butter, the production of margarine now exceeds that of commercial butter in Europe as a whole. Apparently the production of margarine and the production of butter were about equal in 1924 but the production of margarine has shown comparatively greater increases during more recent years. If to the European butter output is added the quantity regularly imported from the Southern Hemisphere and from Russia, the total butter supply of Europe thus roughly calculated would now approximately equal the European production and consumption of margarine. On the same basis of comparison, the total butter supply in 1924 still exceeded the margarine supply, though not greatly. In the Scandinavian countries and the butter-exporting countries of Europe generally, consumption of margarine now greatly exceeds that of butter, and even in Germany and Great Britain the quantities of each consumed are becoming about equal.

Table 1.- Butter and margarine: Estimated per capita consumption in specified countries for years indicated

Country	Year	Butter	Margarine
		Pounds	Pounds
Denmark	1927	12.2	45.2
Sweden	1926	18.6	15.4
Norway	1927	9.6	34.3
Netherlands	1927	12.6	17.9
Germany	1928	19.7	15.9
Great Britain	1927	16.0	a/ 13.3
Canada	1928	29.3	b/
Australia	1928	29.8	b/
New Zealand	Av. 1926-28	34.1	b/
United States	1928	17.3	2.7

Supplement to Handbook of Dairy Statistics, U. S. Department of Agriculture, April, 1930, and "The Margarine Industry of Europe", U. S. Department of Commerce, February, 1930.

a/ Figure for 1928.

b/ Negligible or, as in the case of Canada, nil.

Imports of butter into the United States over the last decade have increased and decreased intermittently as the pressure of foreign supplies was checked at intervals by increased tariff rates. At present, imports are not important in volume.

During January and February, 1931, at a season when the margin of domestic over foreign prices is usually the widest, domestic prices fell to slightly below European prices on comparable grades. (Fig. 31) Seasons of butter supply in the United States and Great Britain are complementary to such an extent (owing to supplies reaching the latter from Southern Hemisphere sources) that imports into the United States tend to be highly seasonal, arriving principally during our winter months. Any exportation of butter to Europe from the United States would tend on the other hand to occur during our spring and fall months. Most of our exports of butter normally go to countries outside of Europe, but during the last decade when exports became in excess of around 7,000,000 pounds such excess has gone to European countries.

Although the importation of butter has been declining as tariff rates have been increasing, the proportion of New Zealand and Danish butter to our total butter importation has been increasing notably throughout recent years. Higher specific rates of duty would tend to bring about such a result, since the duty on relatively high priced butter such as New Zealand or Danish is not so great proportionately as it is on lower priced butter. As shown in the following tabulation. Since the 12-cent tariff went into effect in 1926, New Zealand and Danish butter have comprised as much as four-fifths of our total butter imports.

Table 2.- Butter: Imports into the United States from New Zealand and total imports, 1910-14 and 1919-20 to 1929-30, together with tariff rates in effect over the period

Year ended June 30	Total	Percentage of total			United States	Approximate	
		From Denmark	From New Zealand	From Denmark and New Zealand	tariff rates on butter with dates of change	ad valorem rate 1/	
	1,000 pounds	Per cent	Per cent	Per cent	Cents per lb.	Date effective	Per cent
1910-14	2,480	15.2	10.0	25.2	2.5	10/4/13	11.0
1919-20	20,771	33.8	--	33.8	--	--	4.8
1920-21	34,344	66.5	3.9	70.4	6.0	5/28/21	5.4
1921-22	9,551	30.2	8.8	39.0	--	--	17.6
1922-23	15,772	47.0	24.6	71.6	8.0	9/22/22	21.7
1923-24	29,466	35.5	17.1	52.6	--	--	22.0
1924-25	7,189	11.7	27.6	39.3	--	--	22.5
1925-26	6,440	13.6	34.7	48.3	12.0	4/1/26	21.9
1926-27	10,710	14.3	34.4	48.7	--	--	35.5
1927-28	4,955	15.3	48.4	63.7	--	--	34.5
1928-29	3,299	27.4	50.7	78.1	--	--	32.0
1929-30	2,851	39.0	40.0	79.0	14.0	6/18/30	34.3
July-Dec.							
1929-30	979						30.8
1930-31	600						44.4

Division of Statistical and Historical Research.

1/ Calculated from declared value of imports.

Table 3.- Butter: Exports from United States, total and to Europe,
1912-13 to 1929-30

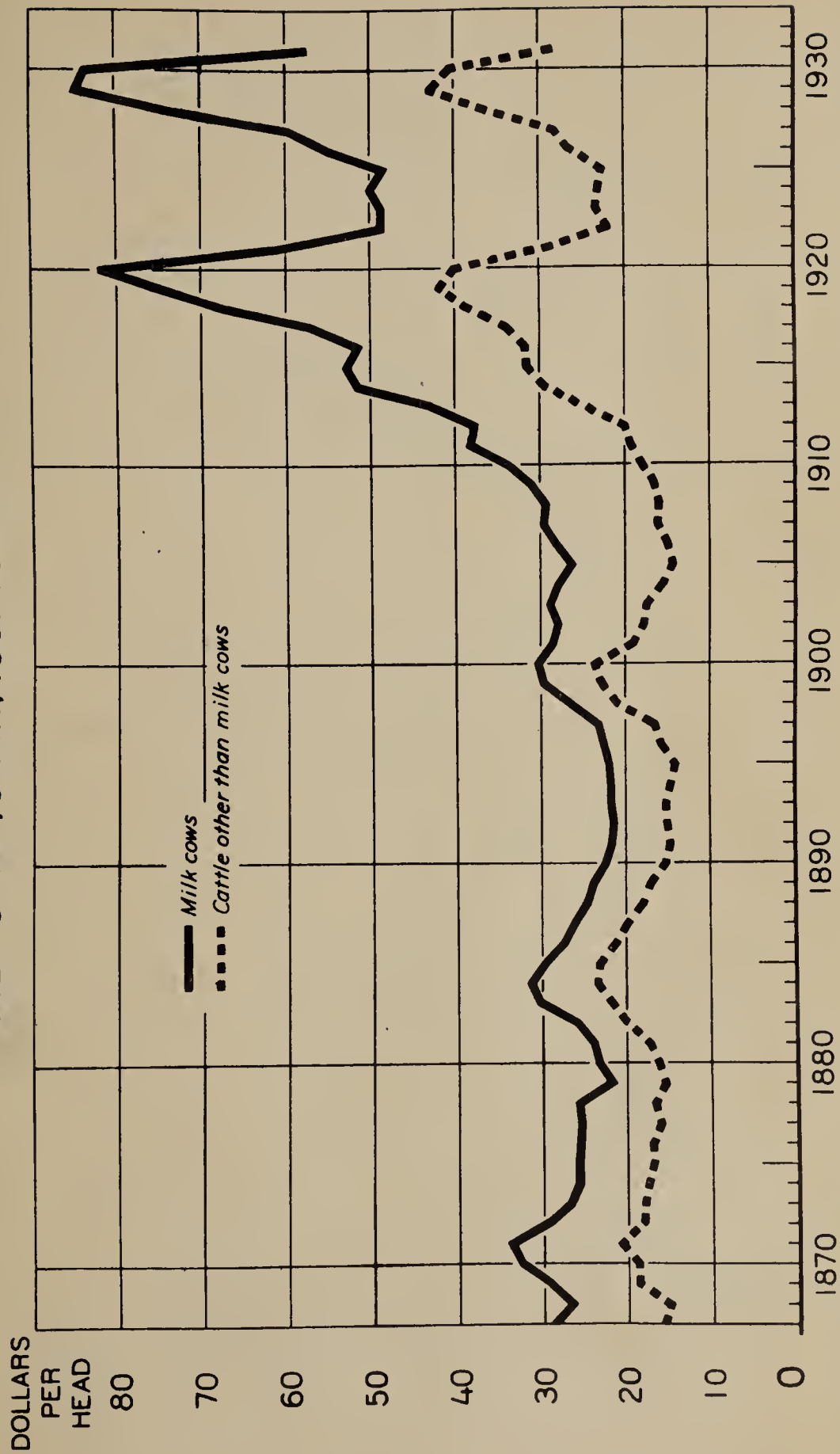
Year ended June 30	Total 1,000 pounds	To Europe 1,000 pounds	Other countries 1,000 pounds
1913	3,586	1	3,585
1914	3,694	737	2,957
1915	9,851	3,340	6,511
1916	13,487	6,622	6,865
1917	26,835	20,955	5,880
1918	17,736	14,253	3,483
1919	33,740	29,675	4,065
1920	27,156	19,696	7,460
1921	7,829	89	7,740
1922	7,512	577	6,935
1923	9,410	3,412	5,998
1924	5,425	65	5,360
1925	8,384	2,679	5,705
1926	5,280	1	5,279
1927	5,048	3	--
1928	3,965	20	--
1929	3,778	9	--
1930	2,954	39	2,915
July-Dec.1929-30 ..	1,749		
July-Dec.1930-31 ..	1,121		

Division of Statistical and Historical Research, Bureau of Agricultural
Economics.

Exportation of dairy products from the United States in any important volume is now confined to condensed, evaporated, and powdered milk. With a domestic price level for dairy products lower than usual in relation to foreign prices, continued high production may stimulate the exportation of the various forms of preserved or dehydrated milk. Thus far, powdered milk is the only product of this group to have shown an actual increased volume of exports during the recent price decline.

Imports of foreign types of cheese are the most stable of all our imports of dairy products. To what extent this import trade may be taken over by domestic production depends upon the degree to which the technique of production of foreign-type cheese is developed in the United States. Under the present tariff rates there appears to be a possibility of increasing the utilization of milk in the United States by expanding the domestic production of these foreign-types of cheese. Swiss cheese production in this country is increasing relative to imports from Switzerland, the recent increase of 50 per cent in the import duty having had an observable effect in checking importation. (Fig. 32).

VALUE PER HEAD OF MILK COWS AND OF CATTLE OTHER THAN MILK COWS, JAN. 1, 1867 TO 1931

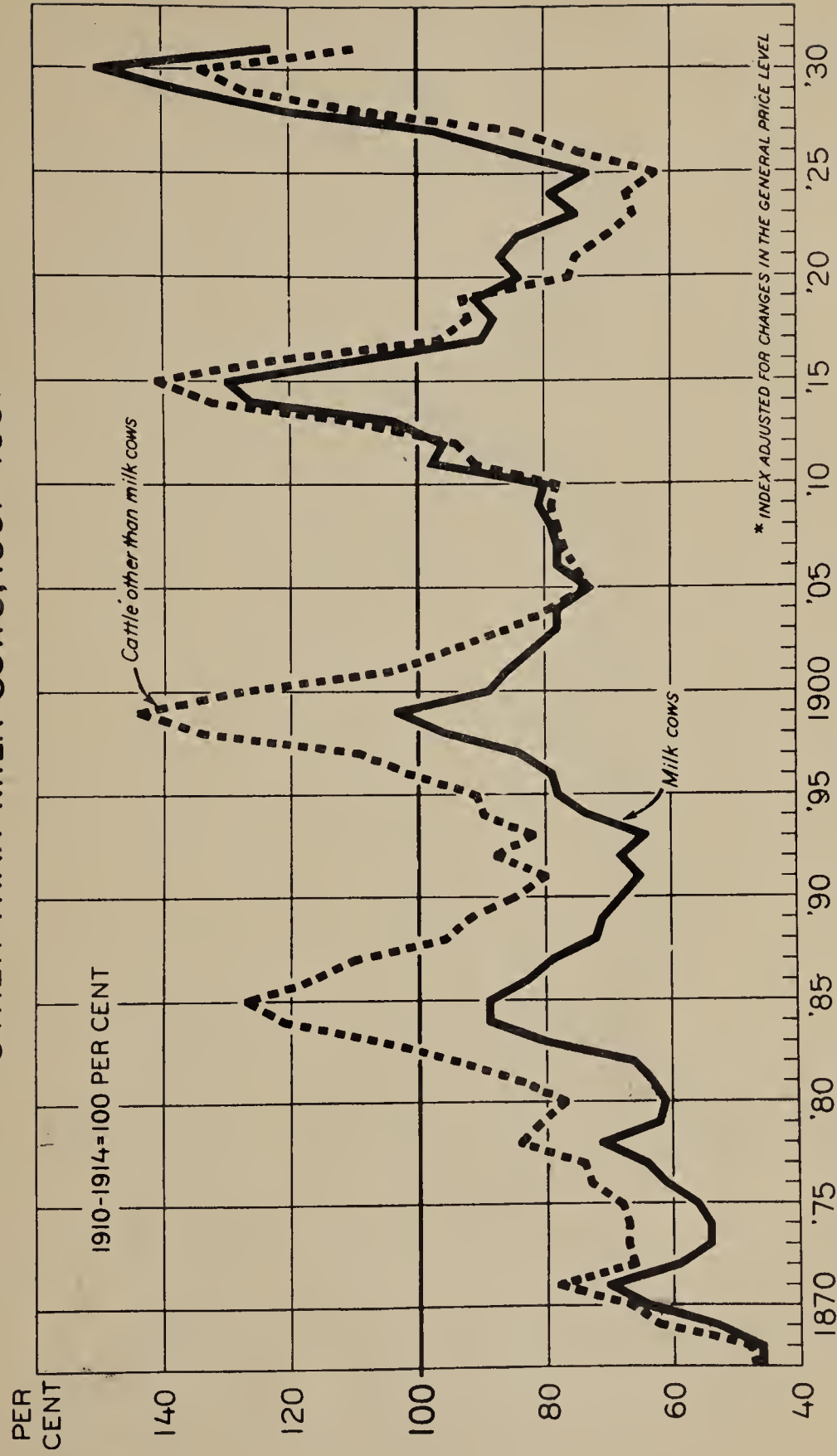


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FIGURE 1 - PRICES OF MILK COWS AND OF CATTLE OTHER THAN MILK COWS HAVE CORRESPONDING CYCLICAL MOVEMENTS. SINCE 1915 CATTLE PRICES HAVE AVERAGED MUCH HIGHER THAN THEY DID PRIOR TO 1905, DUE PRINCIPALLY TO A RISE IN THE LEVEL OF COMMODITY PRICES GENERALLY. THE SHARP DROP IN CATTLE PRICES SINCE 1929 AND 1930 HAS BEEN DUE TO A DECLINE IN THE LEVEL OF COMMODITY PRICES AND THE BEGINNING OF THE DOWNWARD PHASE OF THE CATTLE PRICE CYCLE

* ADJUSTED VALUE PER HEAD OF MILK COWS AND CATTLE
OTHER THAN MILK COWS, 1867-1931

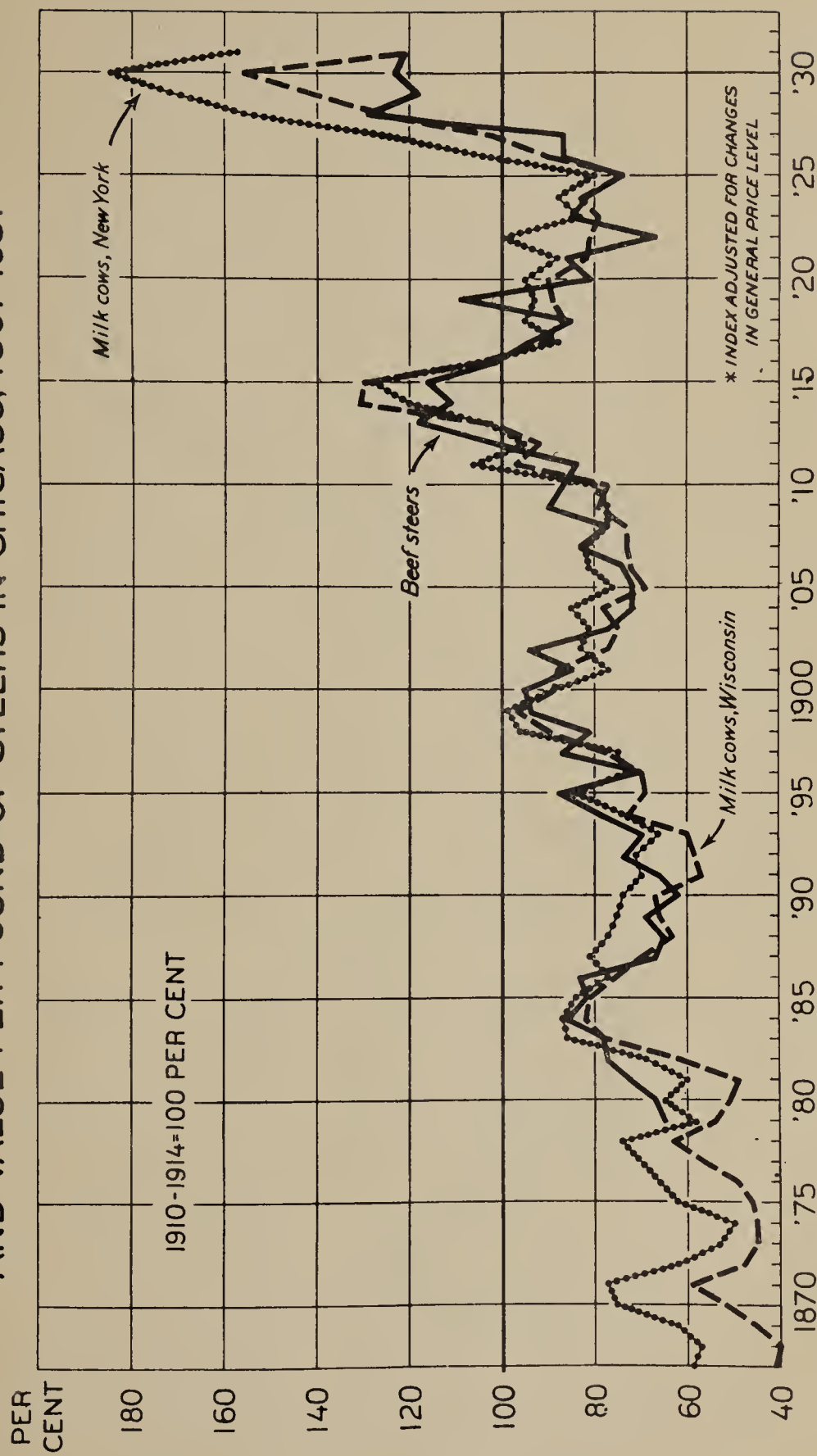


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FIGURE 2 - THE CYCLES IN PRICES OF MILK COWS AND OTHER CATTLE STAND OUT MORE CLEARLY WHEN THE ACTUAL PRICES ARE ADJUSTED TO ELIMINATE THE EFFECTS OF CHANGES IN THE GENERAL PRICE LEVEL. THESE ADJUSTED PRICES HAVE PEAKS ABOUT 14 TO 16 YEARS APART. THE LAST JANUARY 1 PEAK CAME IN 1930. DESPITE SHARP DECLINES IN 1930, CATTLE PRICES ON JANUARY 1, 1931 WERE STILL COMPARATIVELY HIGH

* VALUE PER HEAD OF MILK COWS IN NEW YORK AND WISCONSIN
AND VALUE PER POUND OF STEERS IN CHICAGO, 1867-1931

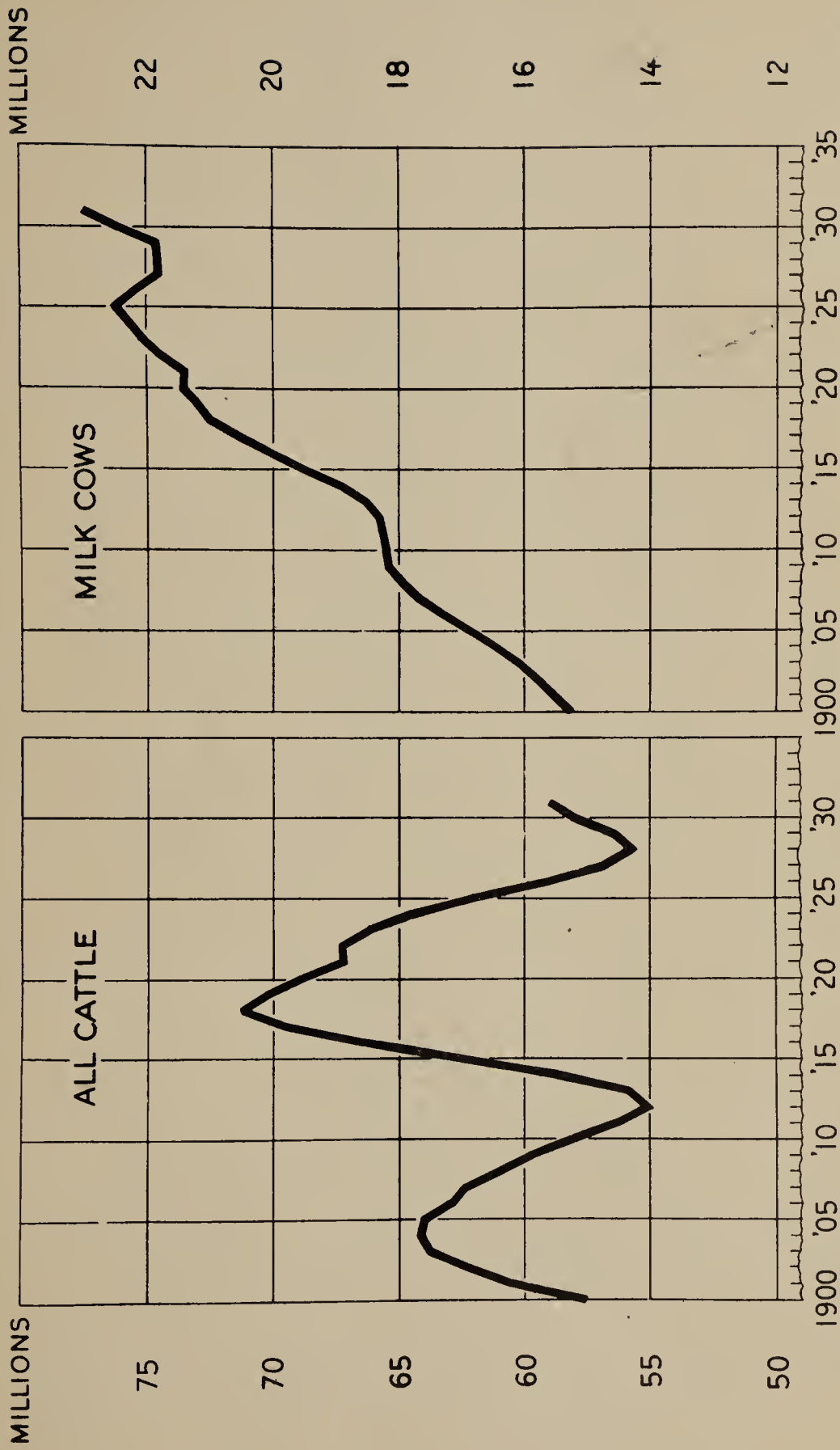


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FIGURE 3 - PRICE CYCLES FOR MILK COWS IN TYPICAL DAIRY STATES AS NEW YORK AND WISCONSIN ARE CLOSELY ASSOCIATED WITH THE PRICE CYCLES FOR BEEF STEERS AT CHICAGO. THE SHORT TIME FLUCTUATIONS IN PRICES OF STEERS, HOWEVER, DIFFER FROM THOSE IN PRICES OF MILK COWS AND THE FLUCTUATIONS IN PRICES IN NEW YORK STATE DIFFER FROM THOSE IN WISCONSIN, DUE TO INFLUENCES WHICH PREVAIL IN THE PARTICULAR MARKETS OVER SHORT PERIODS

NUMBER OF ALL CATTLE AND MILK COWS ON FARMS, JAN. 1, 1900-1931



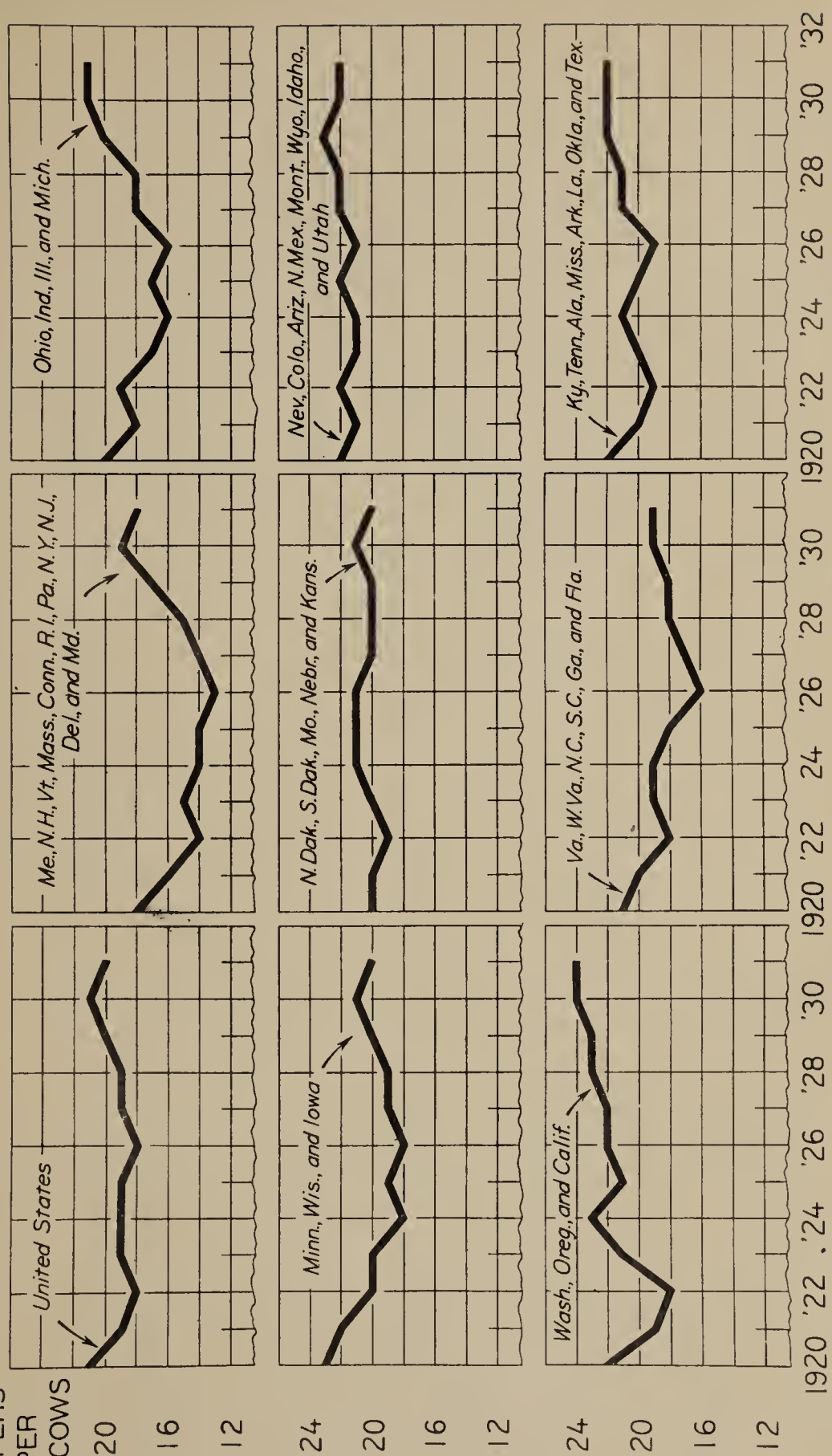
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FIGURE 4 - THE ESTIMATED NUMBERS OF MILK COWS ON FARMS HAVE HAD A MARKED UPWARD TREND SINCE 1900. TOTAL CATTLE NUMBERS HAVE MARKED CYCLICAL MOVEMENTS, THE PEAK IN NUMBERS FREQUENTLY PRECEDING THE LOW POINT IN PRICES, AND THE LOW POINT IN NUMBERS PRECEDING THE HIGH POINT IN PRICES. THE UPWARD PHASE OF THE PRESENT CYCLE IN CATTLE NUMBERS STARTED IN 1929. IN THE LAST CYCLE NUMBERS INCREASED FOR SIX YEARS

HEIFERS 1 TO 2 YEARS OLD BEING KEPT FOR MILK PER 100 MILK COWS 2 YEARS OLD AND OVER

HEIFERS
PER
100 COWS



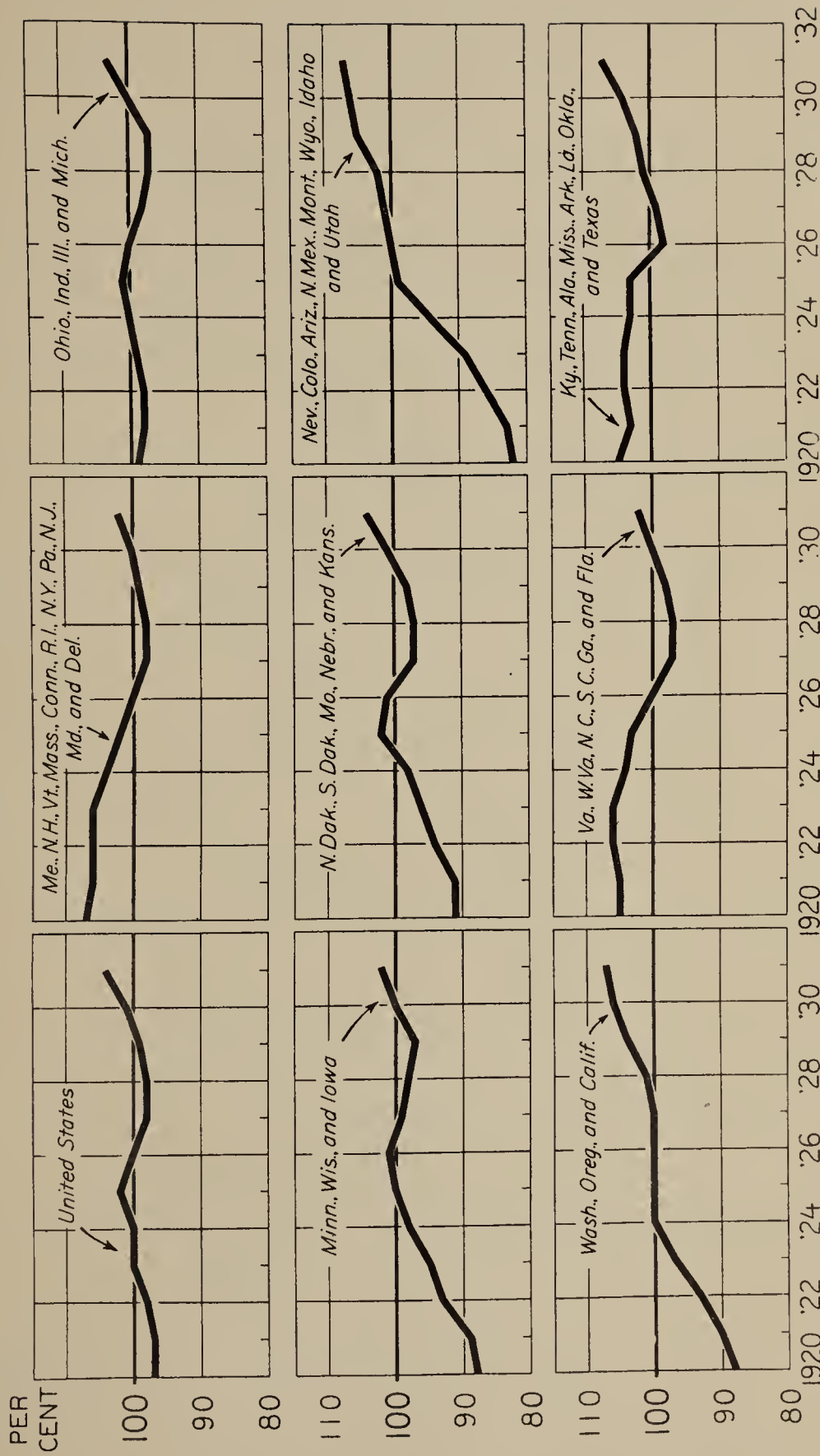
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FIGURE 5 - THE NUMBER OF HEIFERS 1 TO 2 YEARS OLD BEING KEPT FOR MILK COWS DECLINED FROM 21 PER 100 MILK COWS IN 1920 TO 18 IN 1926. SINCE 1926 THE PROPORTION OF HEIFERS TO MILK COWS HAS INCREASED INDICATING A TENDENCY TO EXPAND HERDS. HEIFERS UNDER 1 YEAR OLD BEING KEPT FOR MILK, HOWEVER, WERE LOW IN 1931

NUMBER OF MILK COWS 2 YEARS OLD AND OVER, JAN. 1, 1920-1931

1925-1927 = 100 PER CENT



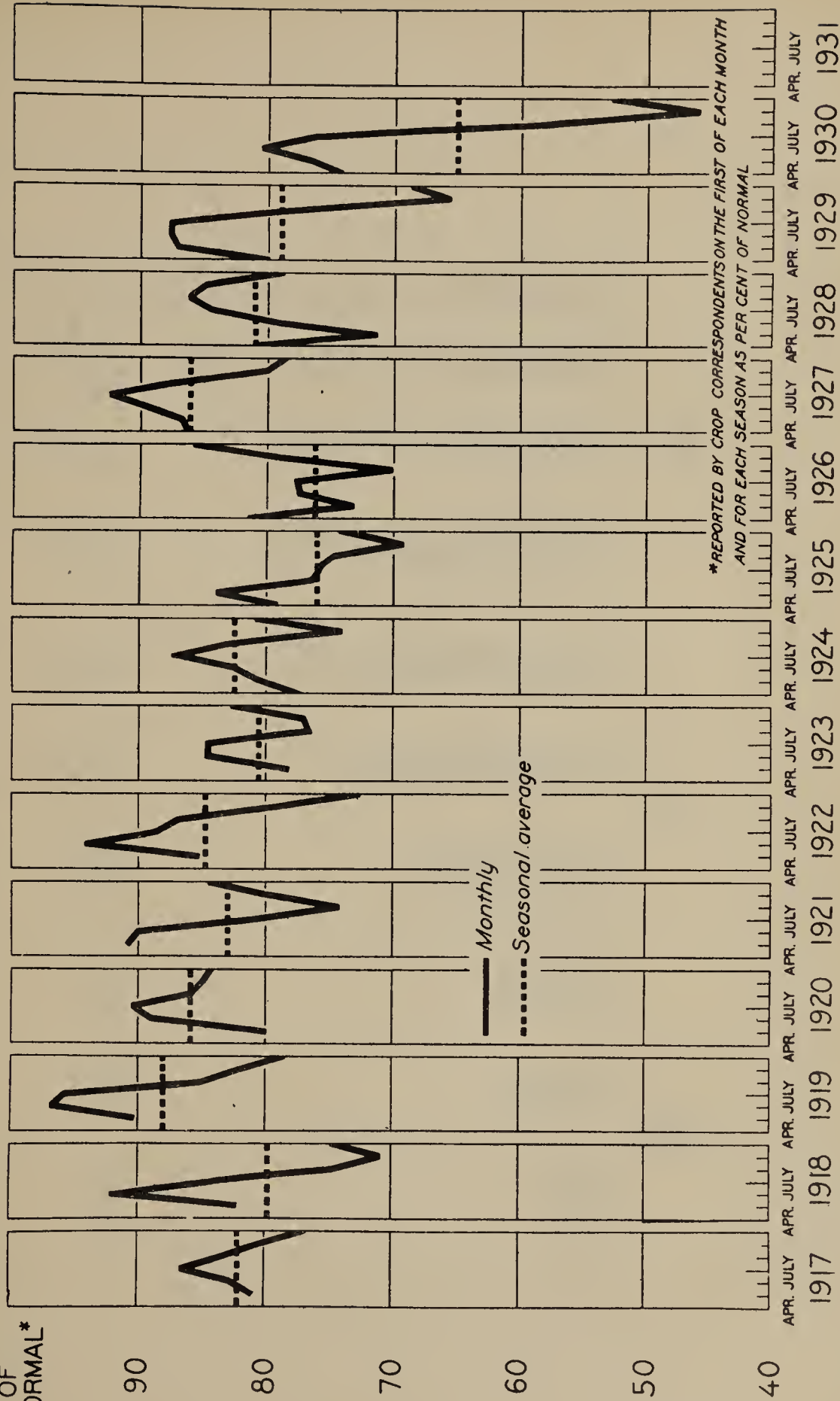
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FIGURE 6 - THE TRENDS IN THE NUMBER OF MILK COWS HAVE BEEN DIFFERENT IN THE SEVERAL SECTIONS OF THE COUNTRY. FOR THE WHOLE PERIOD SINCE 1920, THE TRENDS HAVE BEEN STRONGLY UPWARD IN THE WESTERN AND WEST NORTH CENTRAL STATES WHERE FEED HAS BEEN RELATIVELY CHEAP, BUT THE TRENDS HAVE BEEN DOWNWARD IN THE ATLANTIC SEABOARD STATES. RECENTLY THE TRENDS HAVE BEEN UPWARD IN ALL SECTIONS OF THE COUNTRY

CONDITION OF PASTURES IN DAIRY STATES, 1917-1930 SEASONS

PER CENT
OF
NORMAL*

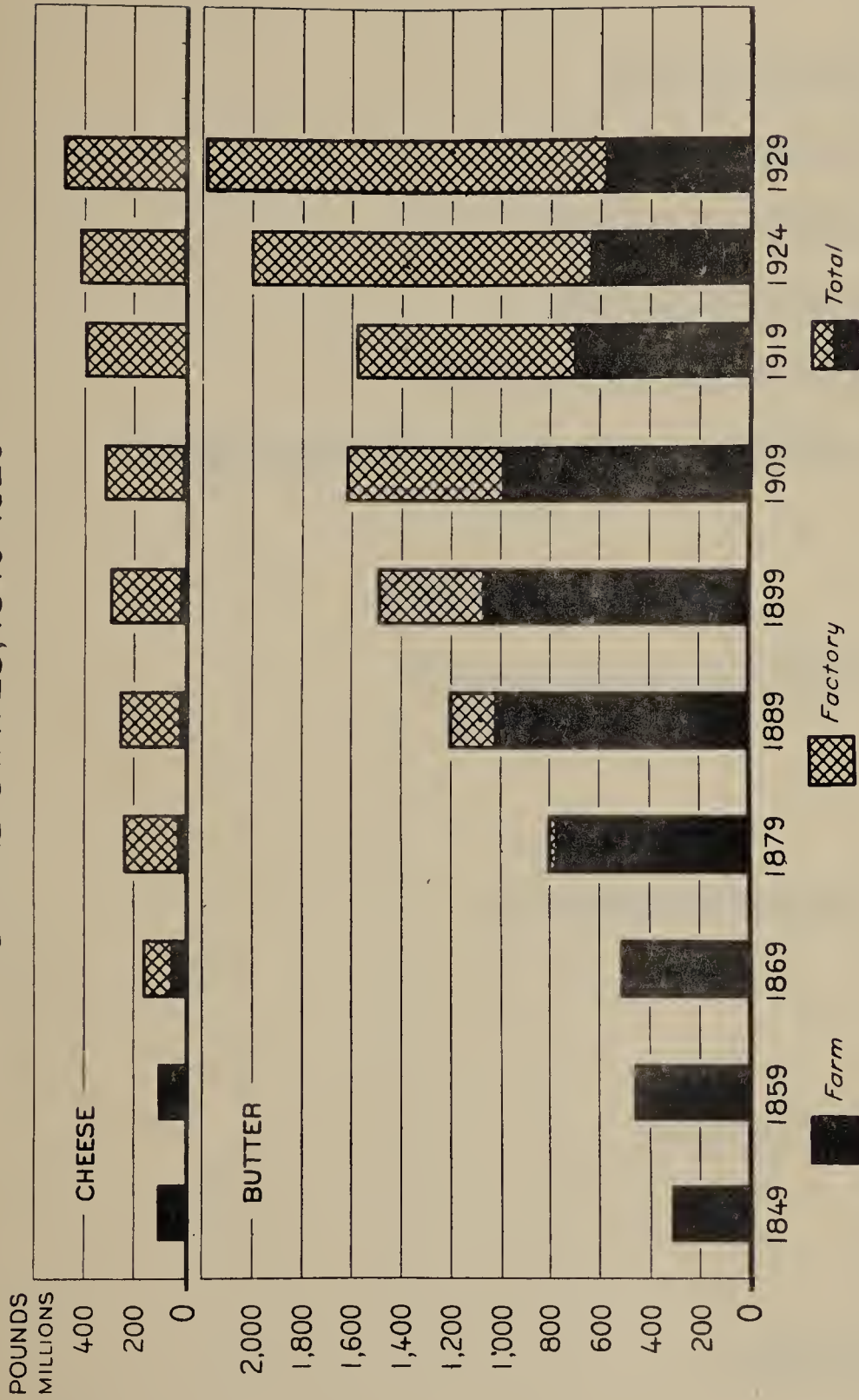


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FIGURE 7 - SUMMER MILK PRODUCTION IS STRONGLY INFLUENCED BY PASTURE CONDITIONS. IN 1930 PASTURE CONDITIONS WERE EXCEPTIONALLY UNFAVORABLE

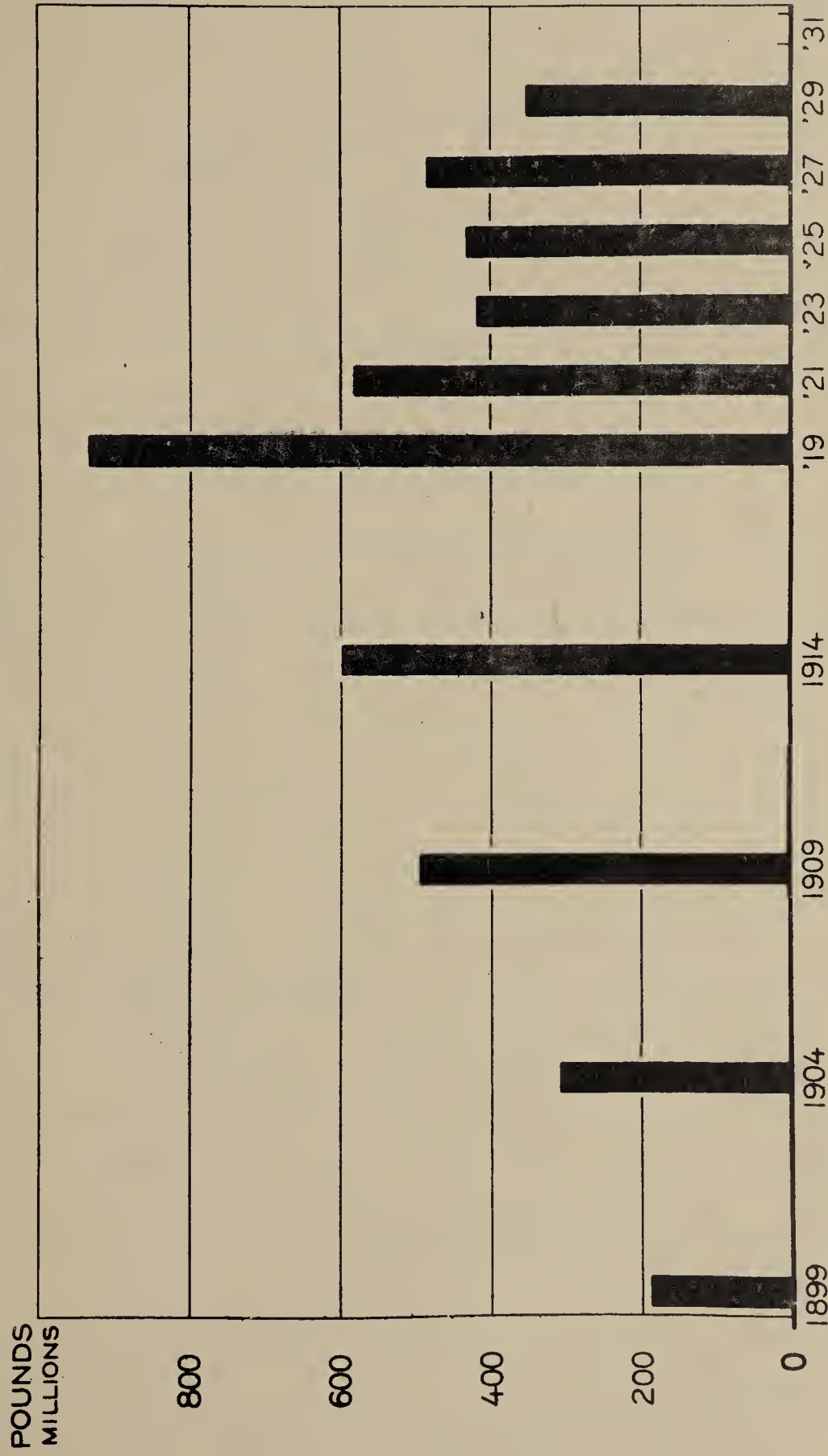
PRODUCTION OF FARM AND FACTORY CHEESE AND BUTTER UNITED STATES, 1849-1929



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FIGURE 8 - TOTAL BUTTER PRODUCTION IN THE UNITED STATES ACCORDING TO CENSUS DATA HAS SHOWN A STEADY UPWARD TREND. THE PEAK OF FARM BUTTER PRODUCTION WAS REACHED IN 1899, AND SINCE THEN FARM PRODUCTION HAS BEEN DECLINING. FACTORY BUTTER PRODUCTION HAS INCREASED THROUGHOUT THE PERIOD. FARM CHEESE PRODUCTION, AS INDICATED BY CENSUS DATA, HAS SHOWN A DOWNWARD TREND, AND COMPARED WITH FACTORY PRODUCTION IS NOW NEGLIGIBLE. THE PRODUCTION OF FACTORY CHEESE, AS INDICATED BY CENSUS DATA, HAS SHOWN AN UPWARD TREND. THE MAGNITUDE OF THE UPWARD TREND IN FACTORY PRODUCTION IS MUCH GREATER THAN THE DECLINE IN FARM PRODUCTION

CONDENSED AND EVAPORATED MILK PRODUCTION IN THE UNITED STATES



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FIGURE 9 - TOTAL PRODUCTION OF CONDENSED AND EVAPORATED MILK, AS INDICATED BY CENSUS DATA INCREASED THROUGH 1919, AND FROM 1923 TO 1929 HAS BEEN BETWEEN THE LEVELS IN 1904 AND 1909

1870-1871

1872-1873

1874-1875

1876-1877

1878-1879

1880-1881

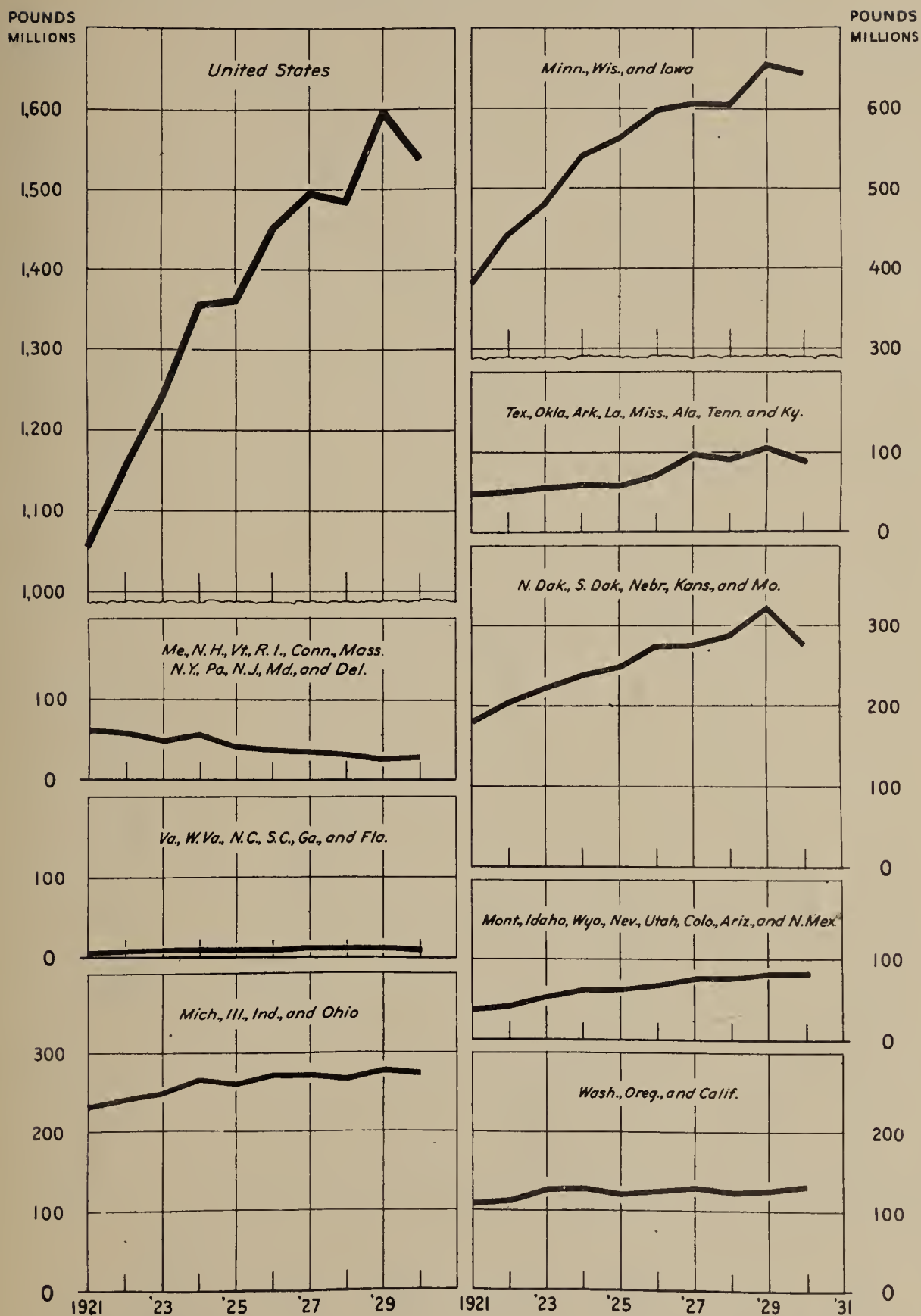
1882-1883

1884-1885

1886-1887

1888-1889

PRODUCTION OF CREAMERY BUTTER BY REGIONS, 1921-1930

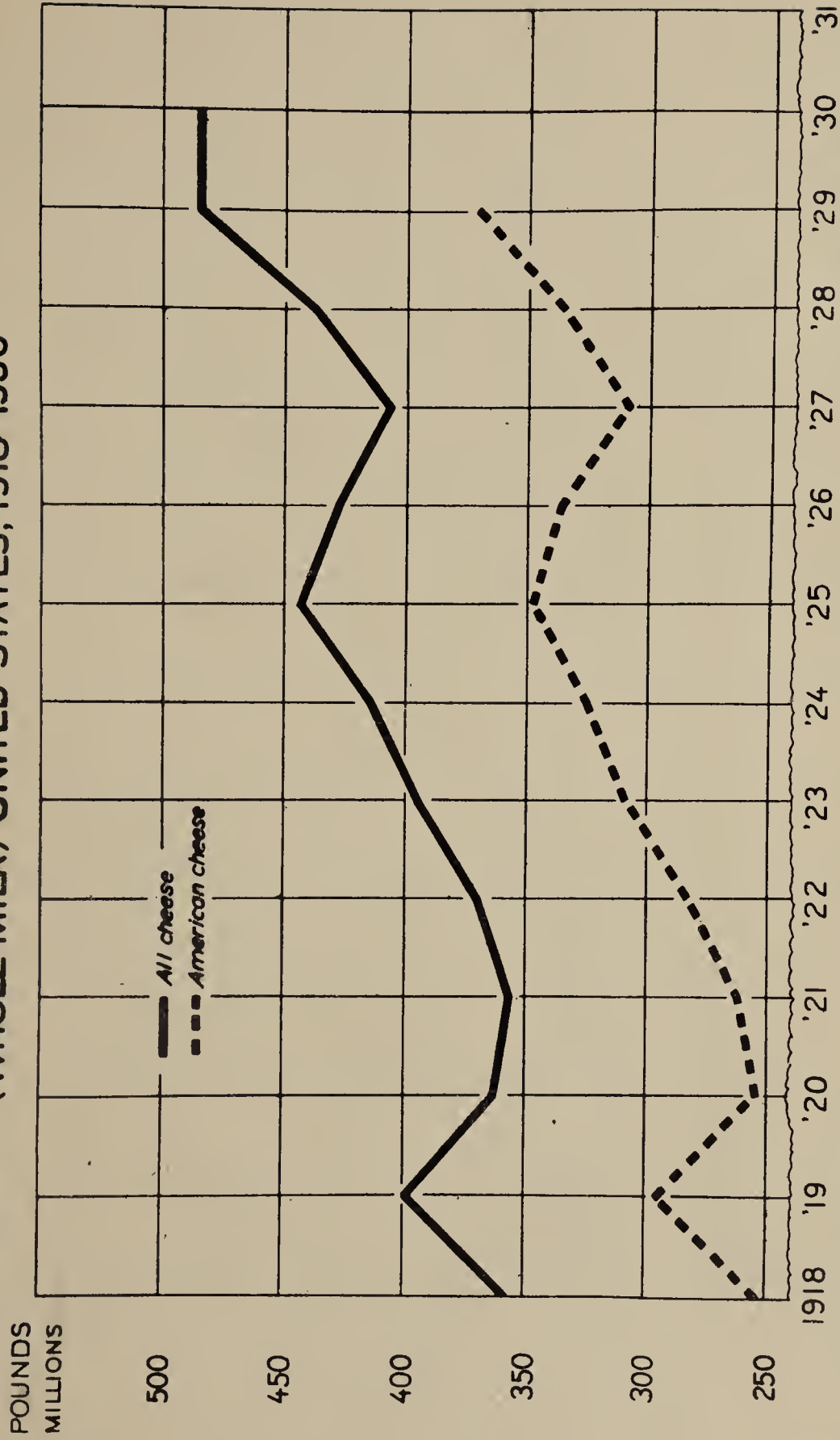


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FIGURE 10 - TOTAL FACTORY PRODUCTION OF BUTTER HAS INCREASED SINCE 1921. PRODUCTION HAS INCREASED IN ALL REGIONS OF THE COUNTRY EXCEPT THE NORTHEASTERN STATES

PRODUCTION OF FACTORY CHEESE AND OF AMERICAN CHEESE (WHOLE MILK) UNITED STATES, 1918-1930

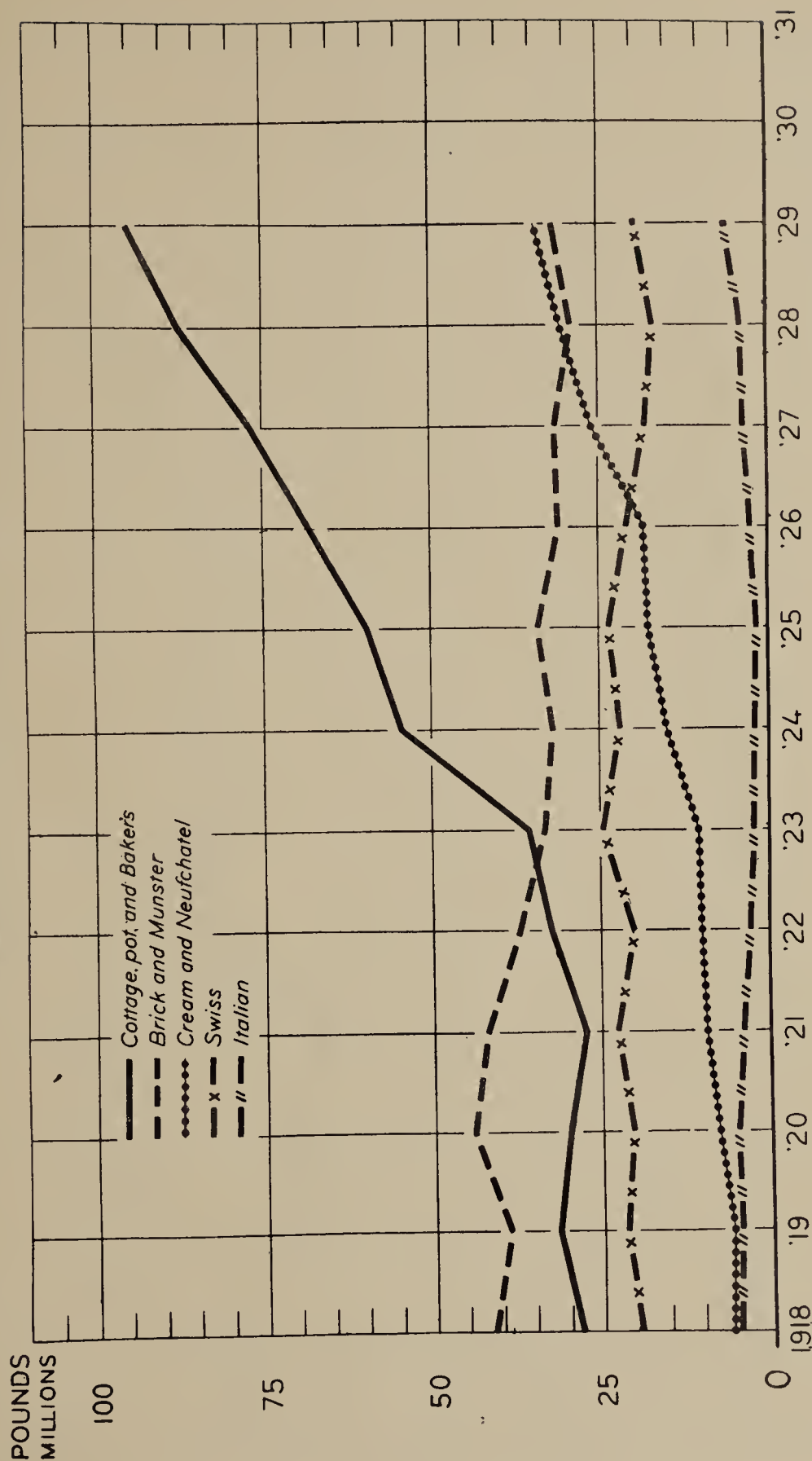


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FIGURE 11 - AMERICAN WHOLE-MILK CHEESE IS THE MOST IMPORTANT TYPE PRODUCED IN THE UNITED STATES AND CONSTITUTES ABOUT 75 PER CENT OF TOTAL CHEESE PRODUCTION. PRODUCTION OF AMERICAN WHOLE-MILK CHEESE HAS HAD AN UPWARD TREND IN THE PERIOD 1917 TO 1929

CHEESE: FACTORY PRODUCTION BY SPECIFIED VARIETIES, UNITED STATES, 1918-1929

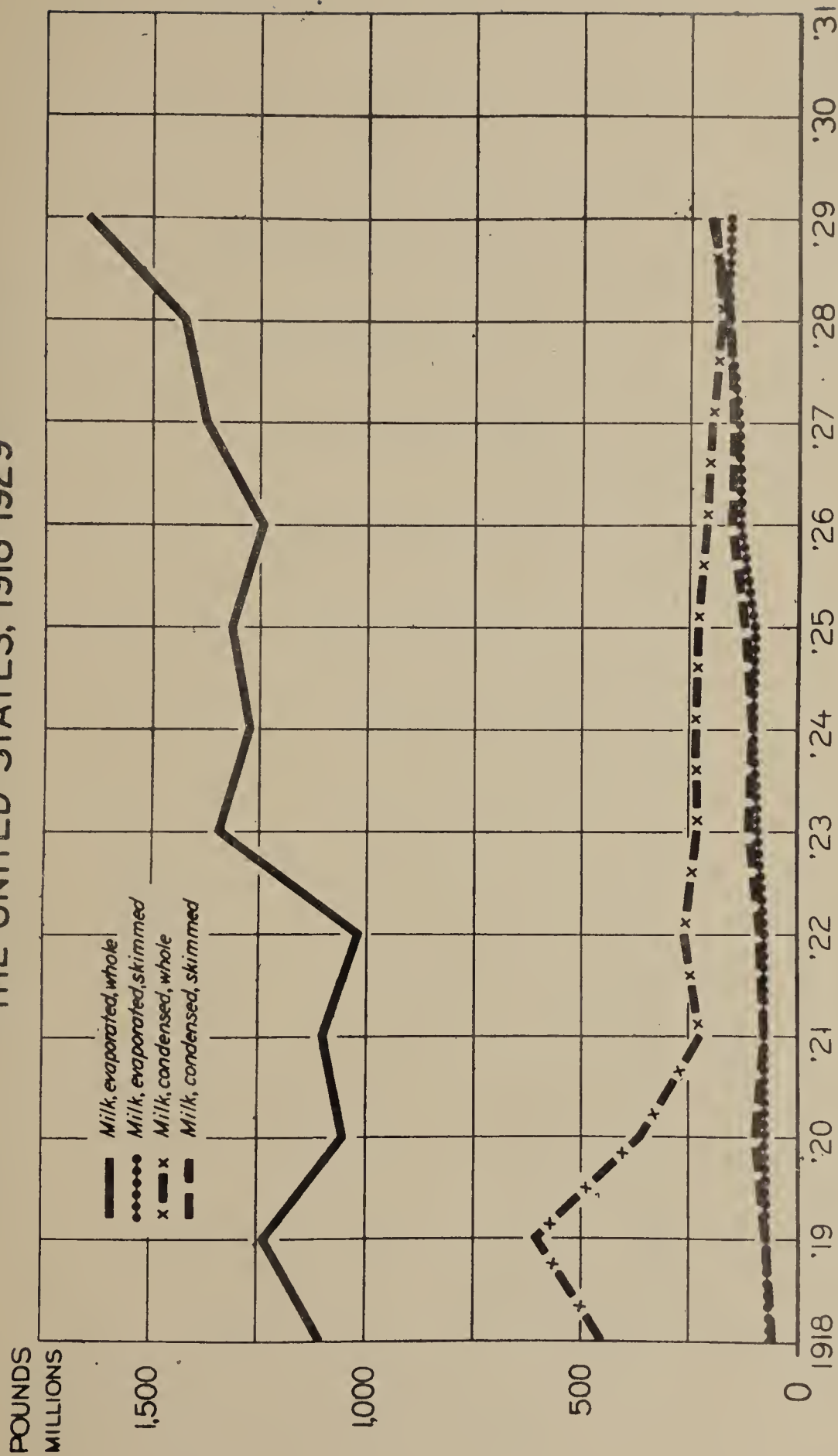


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FIGURE 12 - THE FACTORY PRODUCTION OF COTTAGE CHEESE AND CREAM AND NEUFCHÂTEL CHEESE HAD UPWARD TRENDS SINCE 1918. THE PRODUCTION OF BRICK AND MUNSTER CHEESE HAS DECREASED SLIGHTLY. PRODUCTION OF SWISS HAS REMAINED RELATIVELY CONSTANT FOR THE WHOLE PERIOD SINCE 1918, BUT DECLINED FROM 1925 THROUGH 1928 AND INCREASED IN 1929. THE PRODUCTION OF ITALIAN TYPES OF CHEESE DECLINED TO 1924, BUT HAS INCREASED STEADILY SINCE THEN

EVAPORATED AND CONDENSED MILK PRODUCTION IN THE UNITED STATES, 1918-1929



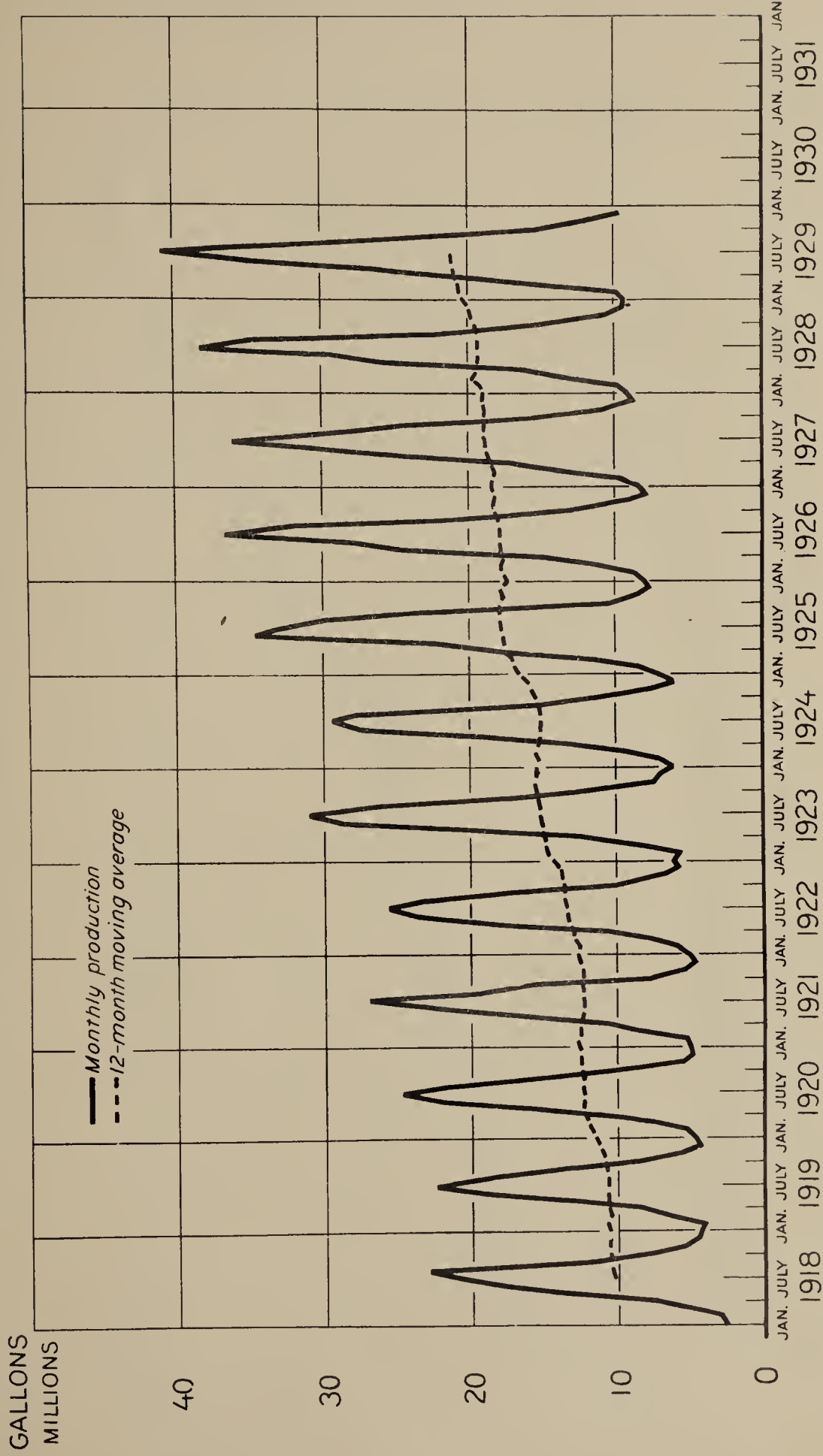
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FIGURE 13 - THE PRODUCTION OF EVAPORATED WHOLE MILK HAS BEEN IRREGULARLY UPWARD SINCE 1922, BUT THE PRODUCTION OF CONDENSED WHOLE MILK HAS BEEN DOWNWARD SINCE 1919. PRODUCTION OF CONDENSED AND EVAPORATED SKIMMED MILK HAD A STEADY UPWARD TREND THROUGHOUT THE PERIOD SINCE 1918

ICE CREAM PRODUCTION, UNITED STATES, 1918-1929

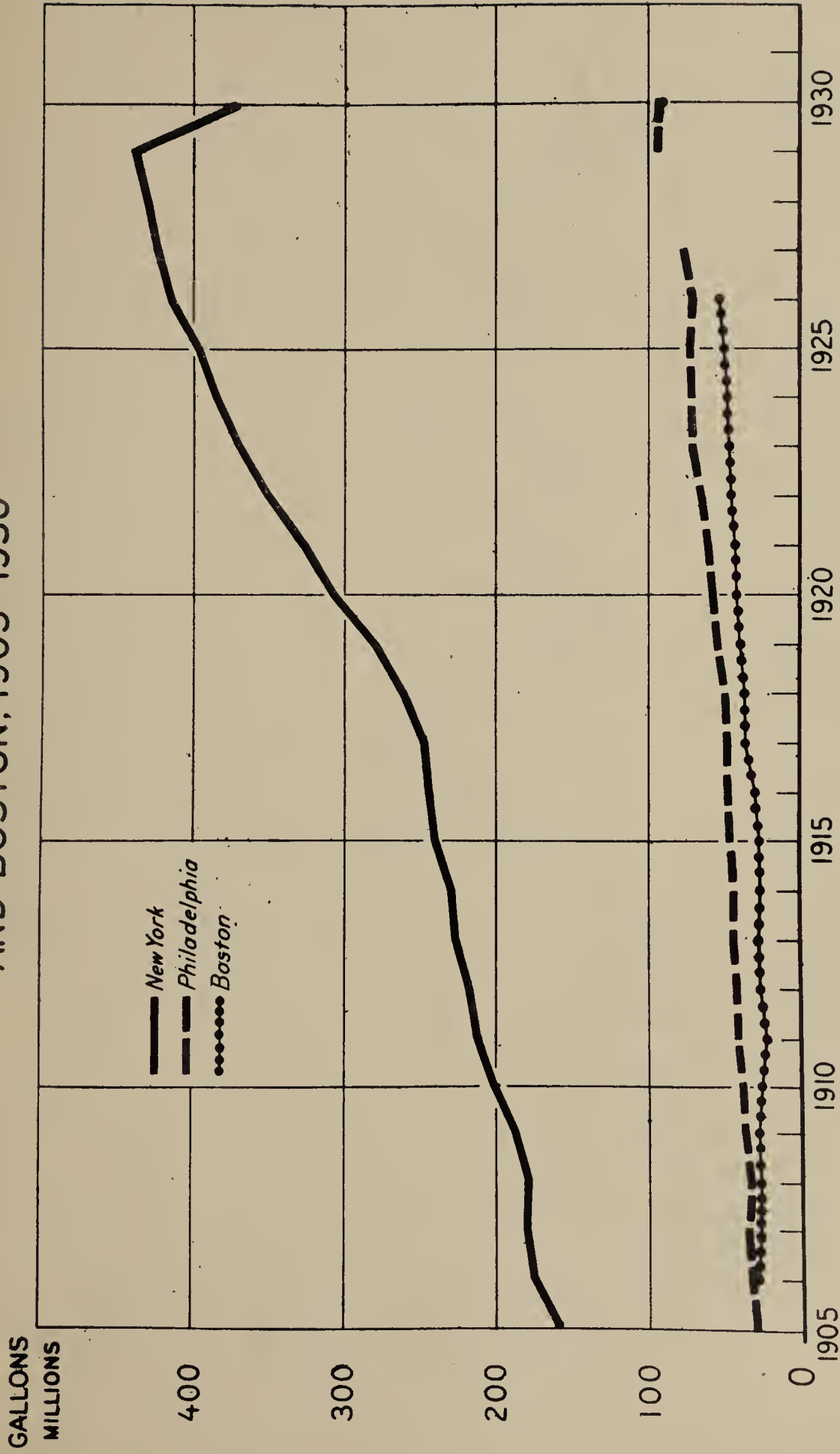


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FIGURE 14 - ICE CREAM PRODUCTION SINCE 1918 SHOWS A DEFINITE UPWARD TREND WITH EXTREMELY SEASONAL VARIATIONS

MARKET MILK RECEIPTS IN NEW YORK, PHILADELPHIA, AND BOSTON, 1905-1930



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FIGURE 15 - MARKET RECEIPTS OF MILK AND CREAM AT NEW YORK, PHILADELPHIA, AND BOSTON SHOW STEADY UPWARD TRENDS SINCE 1905. RECEIPTS AT NEW YORK DROPPED SHARPLY IN 1930

INDEX OF RETAIL PRICES OF COMMODITIES FARMERS BUY

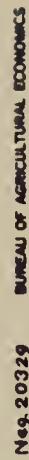
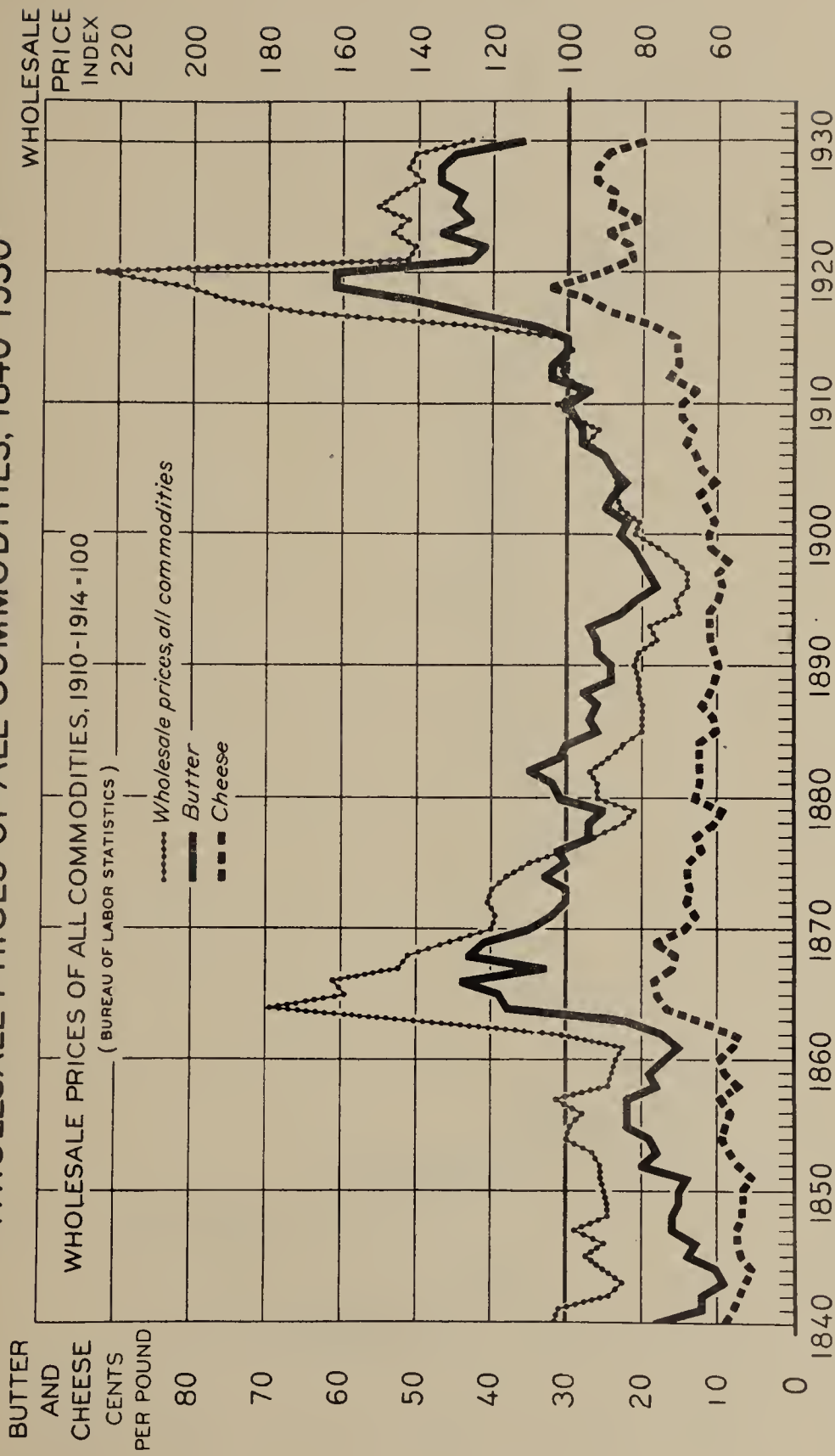


FIGURE 16 - FROM THE DEPRESSION PERIOD OF 1921 UNTIL 1929 FARM PRICES OF BUTTER AND BUTTERFAT ROSE GRADUALLY WHILE THE RETAIL PRICES OF COMMODITIES FARMERS BUY WERE RELATIVELY STABLE. IN 1930 PRICES RECEIVED FOR BUTTER AND BUTTERFAT FELL SHARPLY, BUT PRICES FARMERS PAY FOR THE THINGS THEY BUY FELL ONLY SLIGHTLY. THIS HAS CURTAILED FARMERS' BUYING POWER SEVERELY

PRICES OF BUTTER AND CHEESE AT NEW YORK AND INDEX OF WHOLESALE PRICES OF ALL COMMODITIES, 1840-1930

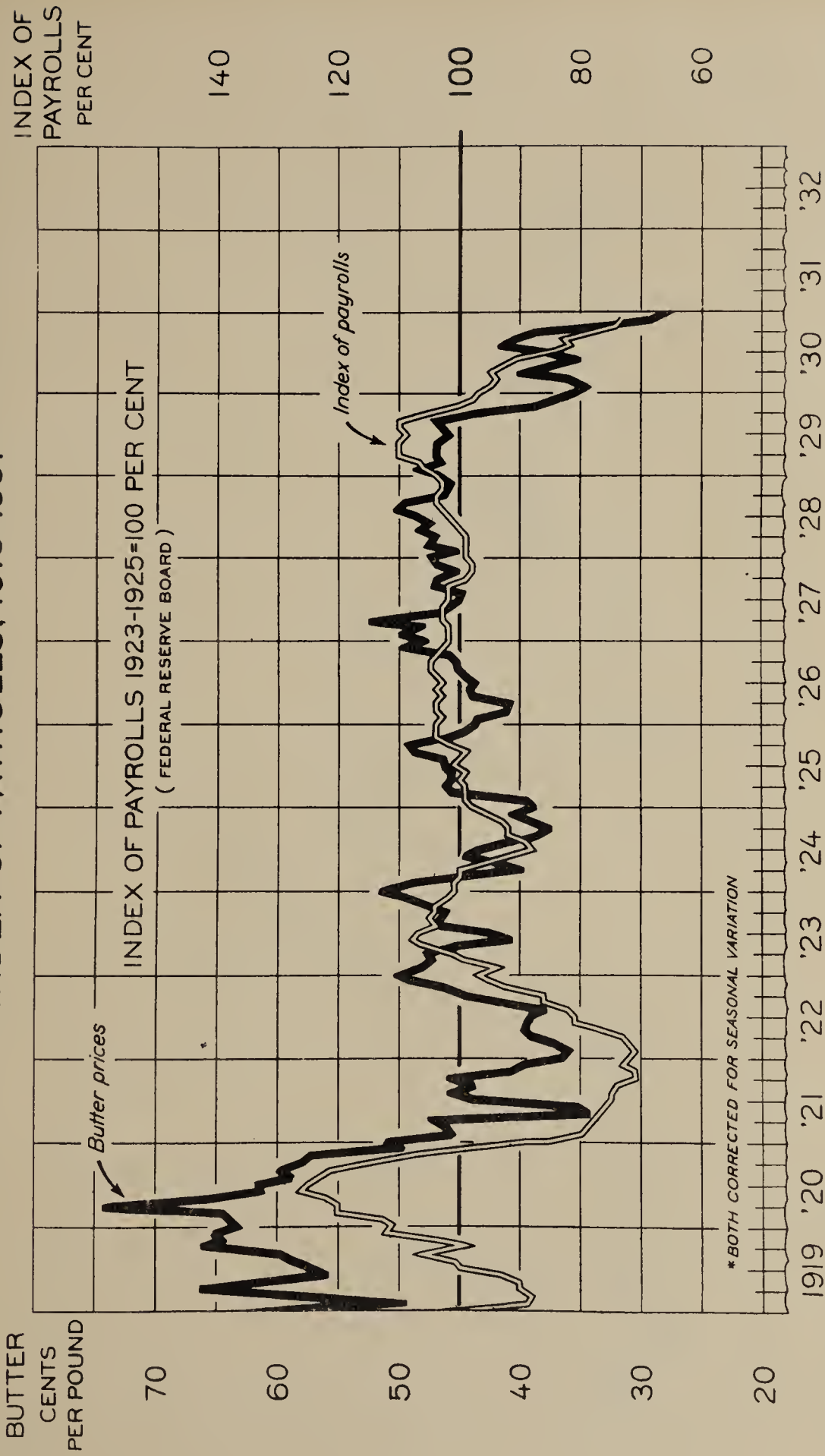


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FIGURE 17 - THE LONG-TIME TRENDS IN BUTTER AND CHEESE PRICES RESULT FROM LONG-TIME TRENDS IN THE GENERAL PRICE LEVEL. FOLLOWING THE CIVIL WAR PRICES OF BOTH BUTTER AND CHEESE FELL SHARPLY AS DID THE GENERAL PRICE LEVEL UNTIL 1879 AND THEN GRADUALLY UNTIL ABOUT 1896. SINCE THE WORLD WAR, COMMODITY PRICE LEVELS HAVE HAD A DOWNWARD TREND AND THIS APPEARS LIKELY TO CONTINUE, ALTHOUGH SOME RECOVERY IS TO BE EXPECTED IN COMMODITY PRICES WHEN BUSINESS IMPROVES

* PRICE OF 92-SCORE BUTTER AT NEW YORK AND INDEX OF PAYROLLS, 1919-1931

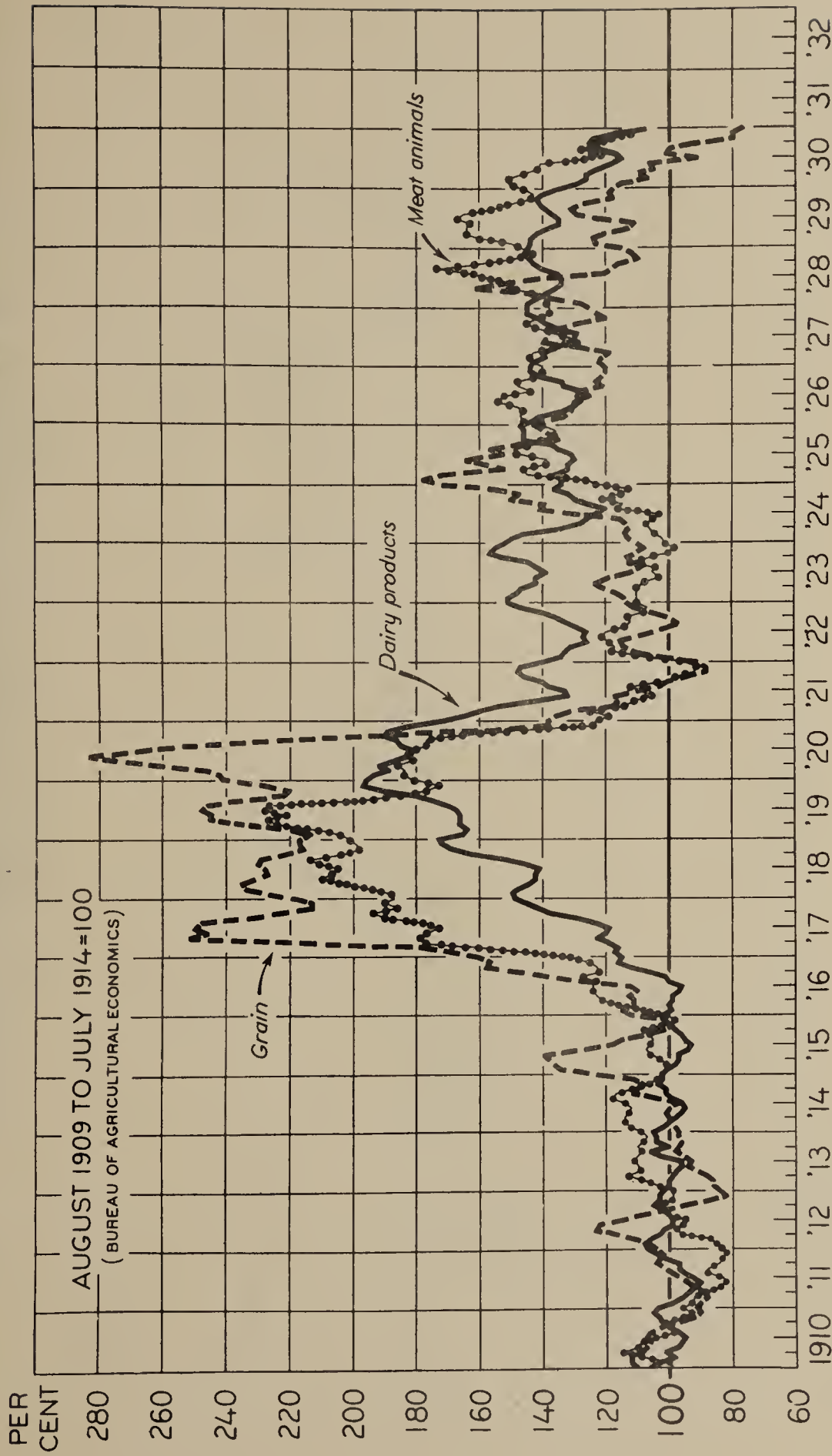


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FIGURE 18 - THE DECLINE IN CONSUMER INCOMES, AS REFLECTED BY A DECLINE IN PAY ROLLS, WAS LARGELY RESPONSIBLE FOR THE DECLINE IN BUTTER PRICES IN 1930. WHEN PAY ROLLS INCREASE FOLLOWING THE PRESENT DEPRESSION THIS SHOULD STRENGTHEN THE BUTTER MARKET

FARM PRICES OF DAIRY PRODUCTS, MEAT ANIMALS, AND GRAIN, 1910-1931



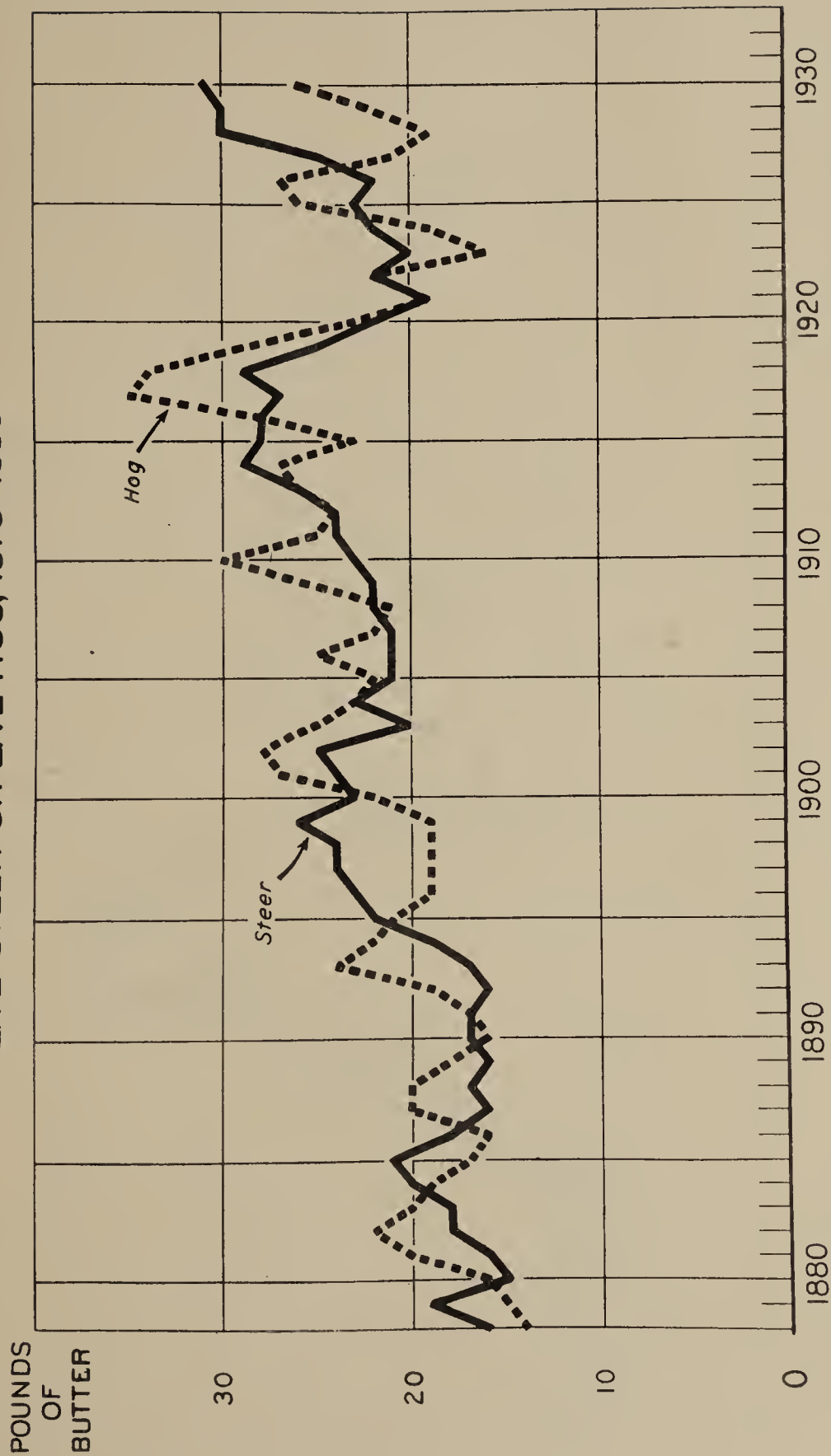
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FIGURE 19 - WHEN PRICES OF DAIRY PRODUCTS ARE HIGH IN RELATION TO GRAIN PRICES THERE IS A TENDENCY TO EXPAND DAIRY OUTPUT. THERE IS ALSO A TENDENCY TO SHIFT BETWEEN DAIRY AND OTHER LIVESTOCK ENTERPRISES AS ONE OR THE OTHER BECOMES MORE PROFITABLE. AT PRESENT PRICES, BOTH MEAT ANIMALS AND DAIRY PRODUCTS ARE HIGH IN COMPARISON WITH PRICES FOR GRAIN, AND THIS WILL TEND TO ENCOURAGE DAIRYING

BUTTER EQUIVALENT IN PRICE TO 100 POUNDS OF LIVE STEER OR LIVE HOG, 1878-1930

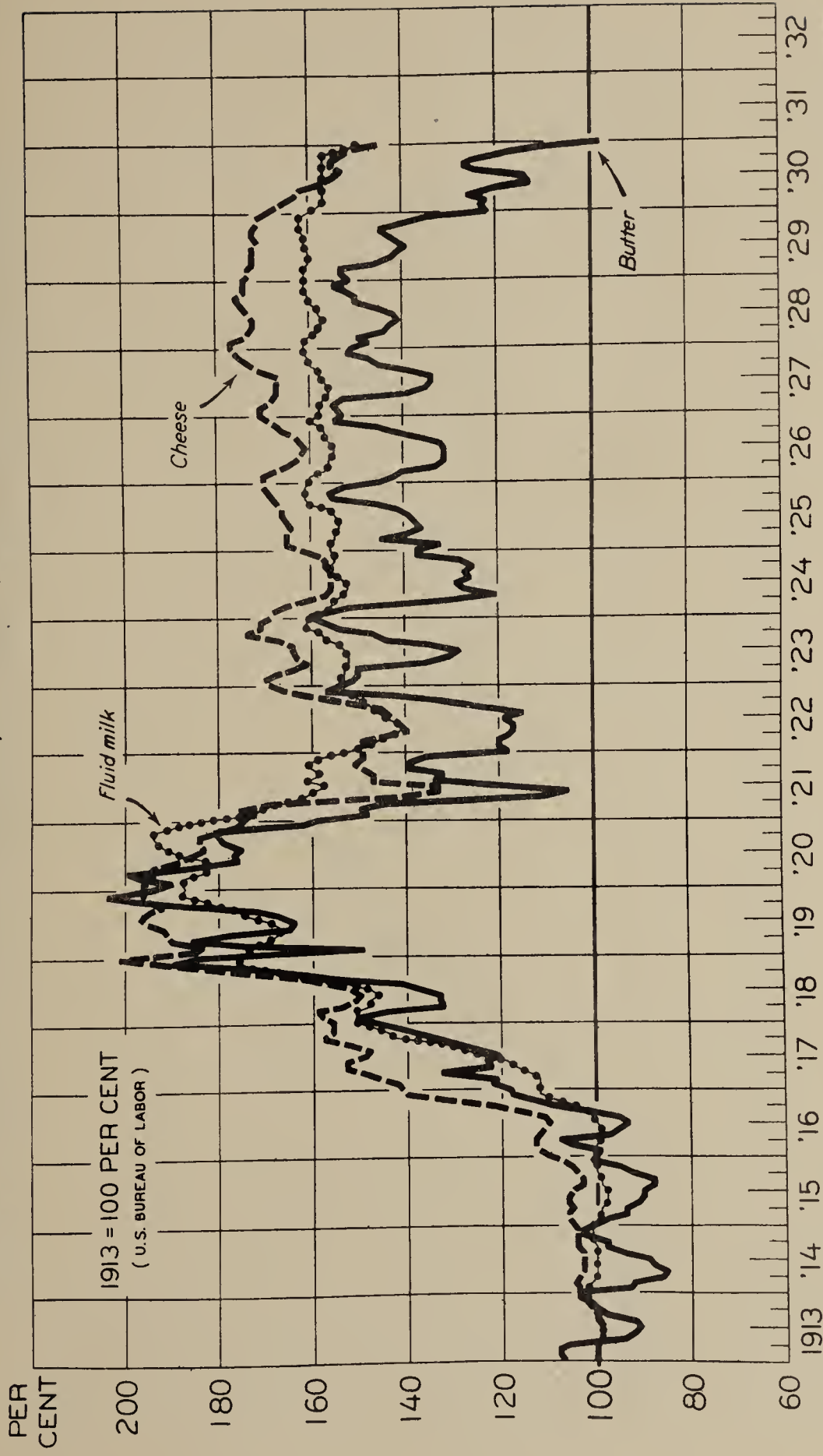


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FIGURE 20 - THROUGHOUT MOST OF THE PAST DECADE STEER AND HOG PRICES HAVE BEEN LOW IN TERMS OF BUTTER. WITH THE RISE IN BEEF PRICES IN 1928 AND THE SHARP DROP IN BUTTER PRICES IN 1930 THE RELATIONSHIP HAS BEEN REVERSED. THE INCREASE IN CATTLE NUMBERS NOW UNDER WAY MAKES IT DOUBTFUL THAT STEER PRICES WILL CONTINUE SUFFICIENTLY HIGH AS COMPARED WITH BUTTER TO CAUSE ANY LONG-CONTINUED SHIFT FROM DAIRYING TO BEEF PRODUCTION

RETAIL PRICES OF FLUID MILK, BUTTER, AND CHEESE, 1913-1931

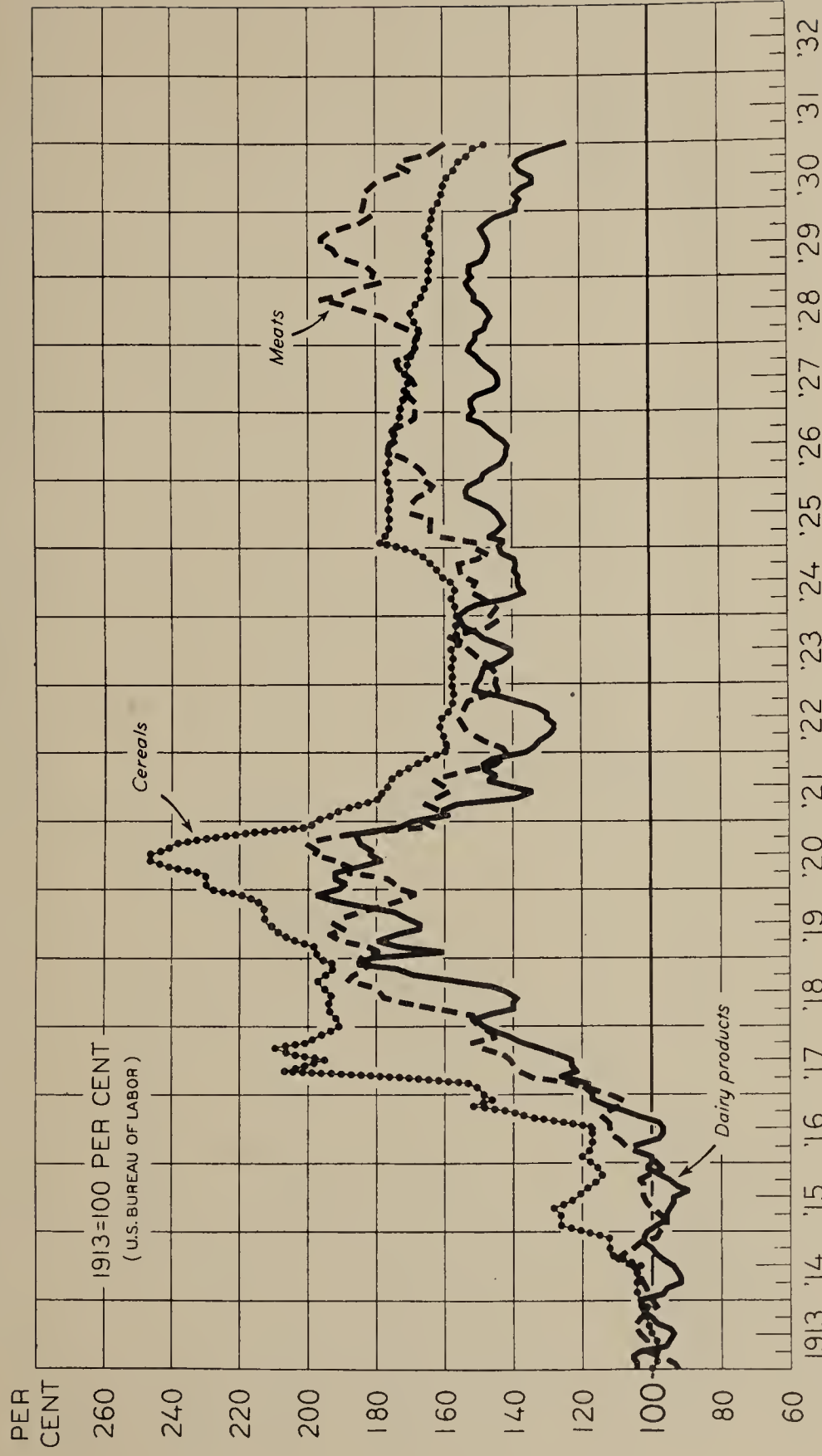


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FIGURE 21 - RETAIL PRICES OF FLUID MILK WERE RELATIVELY STABLE FROM 1923 TO 1930 AND WERE HIGH IN COMPARISON WITH BUTTER PRICES, BUT NOT SO HIGH RELATIVE TO PRE-WAR RELATIONSHIPS AS WERE CHEESE PRICES. IN THE PRESENT DEPRESSION BUTTER PRICES FELL FIRST, THEN CHEESE PRICES, AND FINALLY FLUID MILK PRICES. THIS WAS THE SAME ORDER IN WHICH THEY FELL IN 1920. AT THE BEGINNING OF 1931 THE MARGIN BETWEEN MILK PRICES AND BUTTER PRICES WAS UNUSUALLY WIDE

RETAIL PRICES OF DAIRY PRODUCTS, MEATS, AND CEREALS, 1913-1931

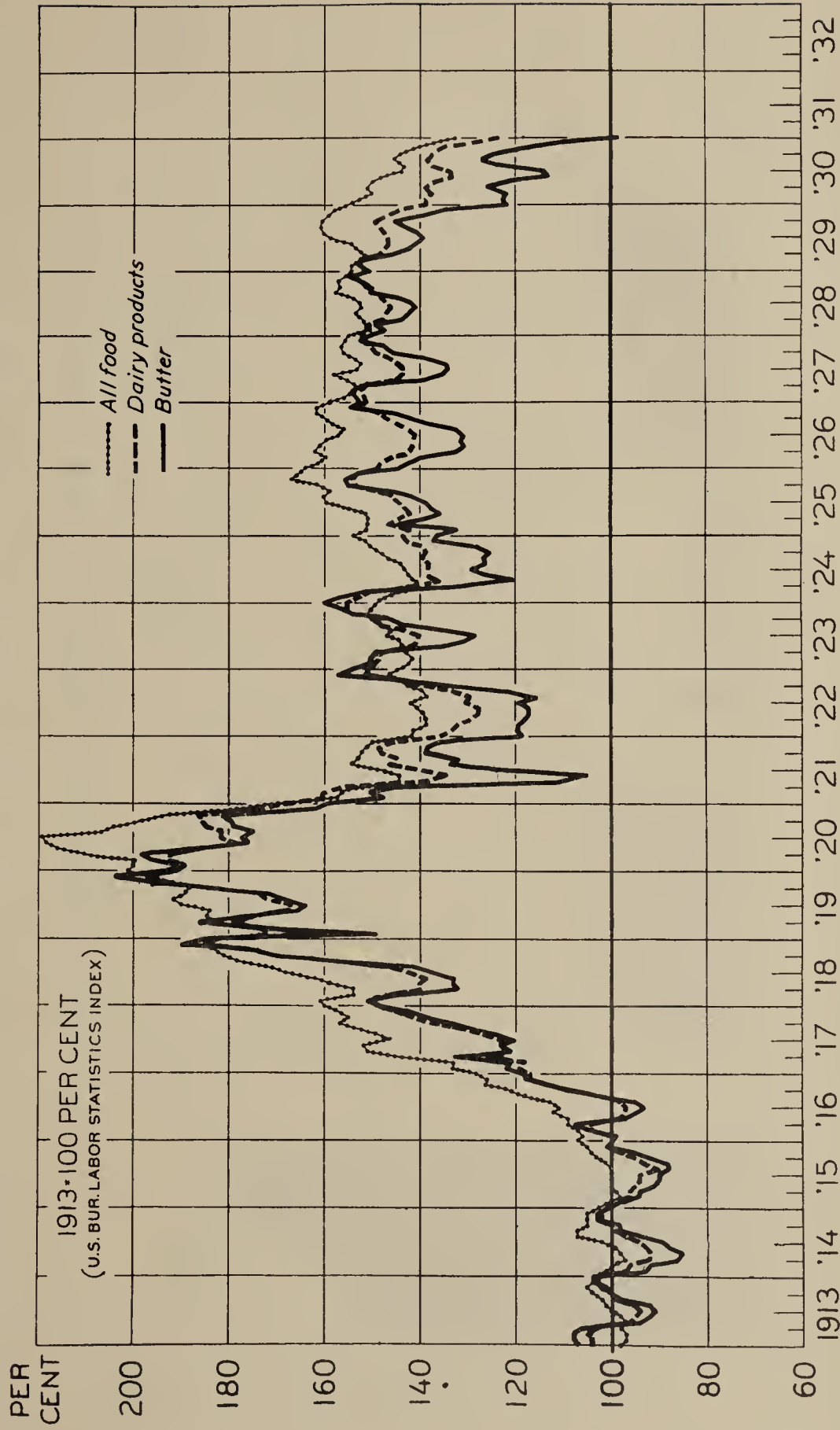


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FIGURE 22 - SINCE 1924 RETAIL PRICES OF DAIRY PRODUCTS HAVE BEEN LOW IN COMPARISON WITH PRE-WAR RELATIONSHIPS TO RETAIL PRICES OF CEREALS AND MEATS. PRODUCTION OF DAIRY PRODUCTS HAS INCREASED, WHILE CATTLE NUMBERS WERE DECREASING AND CAUSING MEAT PRICES TO RISE. RETAIL PRICES OF CEREALS ARE PROBABLY INFLUENCED TO A LARGE EXTENT BY PRICES PAID FOR BRANDED FOODS. CHANGES IN THE CHARGES FOR RETAIL DISTRIBUTION OF THESE COMMODITIES SINCE THE PRE-WAR PERIOD ARE APPARENTLY RESPONSIBLE FOR DIFFERENCES IN THE RELATIVE LEVELS OF THESE RETAIL PRICES AS COMPARED WITH THE PRICES OF DAIRY PRODUCTS, MEAT ANIMALS, AND GRAINS

RETAIL PRICES OF ALL FOOD, DAIRY PRODUCTS, AND BUTTER, 1913-1931



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FIGURE 23 - RETAIL PRICES OF ALL DAIRY PRODUCTS HAVE BEEN LOW IN COMPARISON WITH RETAIL PRICES OF ALL FOOD DURING MOST OF THE POST-WAR PERIOD. BUTTER PRICES HAVE BEEN LOWER THAN THE AVERAGE OF ALL DAIRY PRODUCTS

PER CAPITA CONSUMPTION OF DAIRY PRODUCTS IN THE UNITED STATES 1917-1930

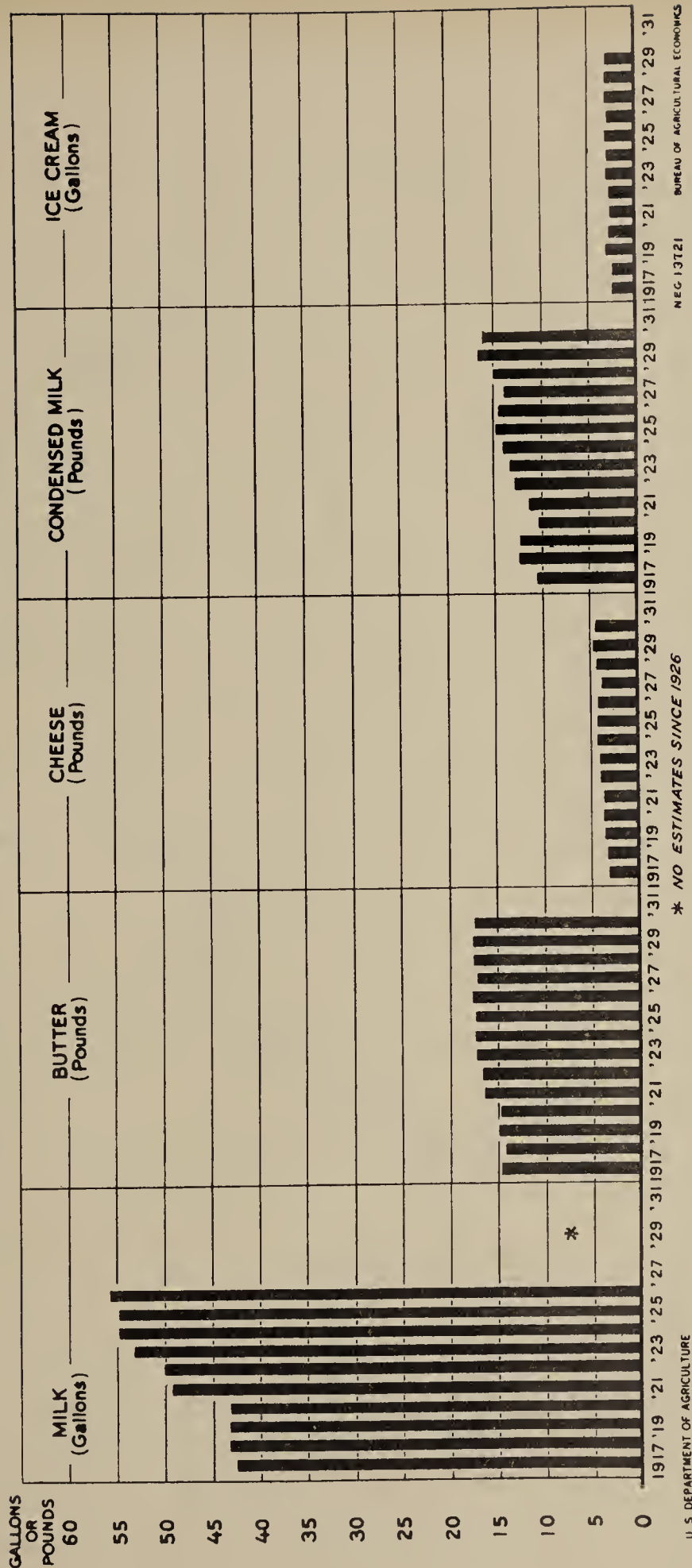
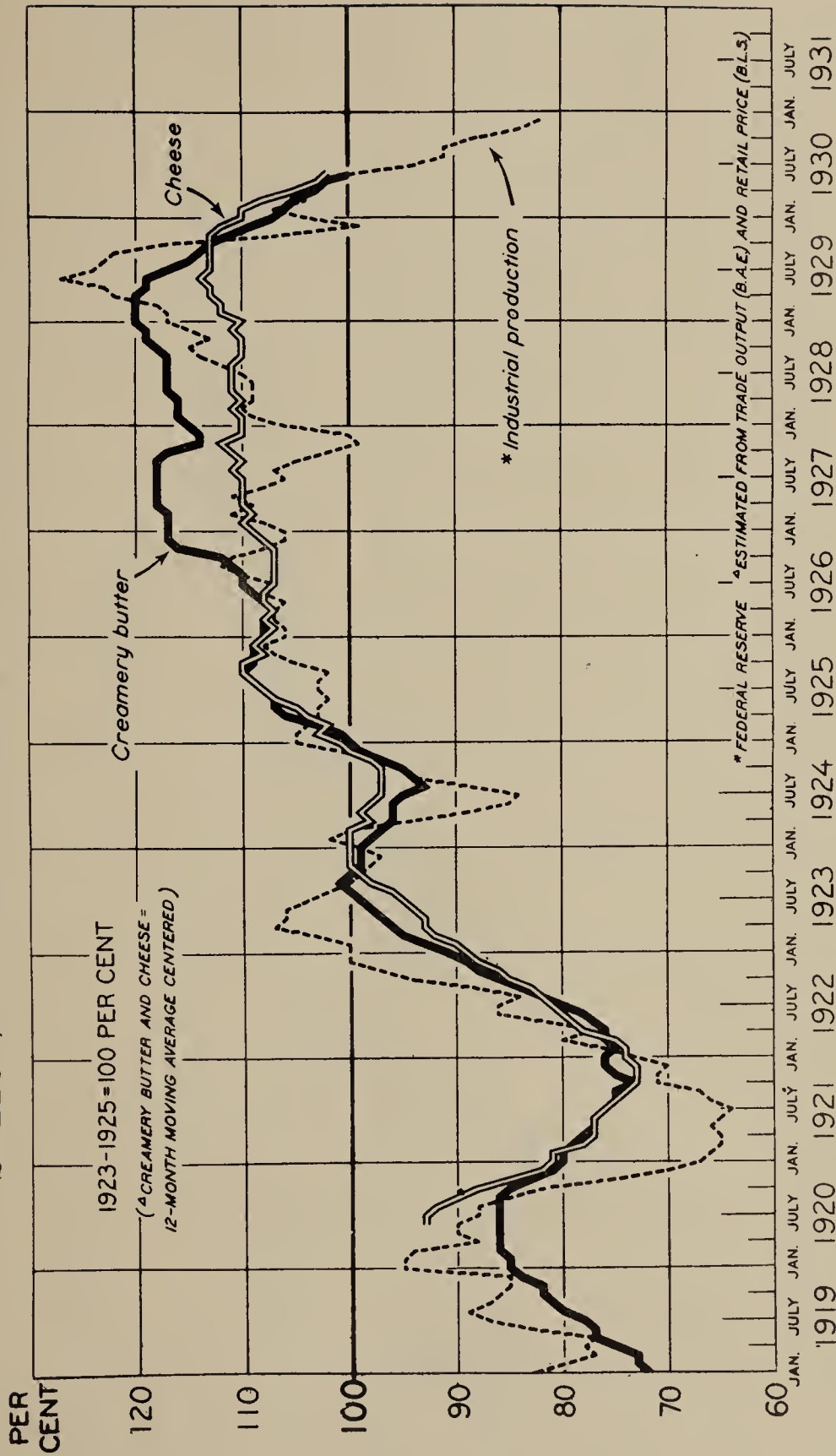


FIGURE 24 - THE TREND IN PER CAPITA CONSUMPTION OF EACH OF THE IMPORTANT DAIRY PRODUCTS HAS BEEN UPWARD SINCE THE WAR

MONEY SPENT BY CONSUMERS FOR CREAMERY BUTTER AND FOR CHEESE, AND INDUSTRIAL PRODUCTION, 1919-1930



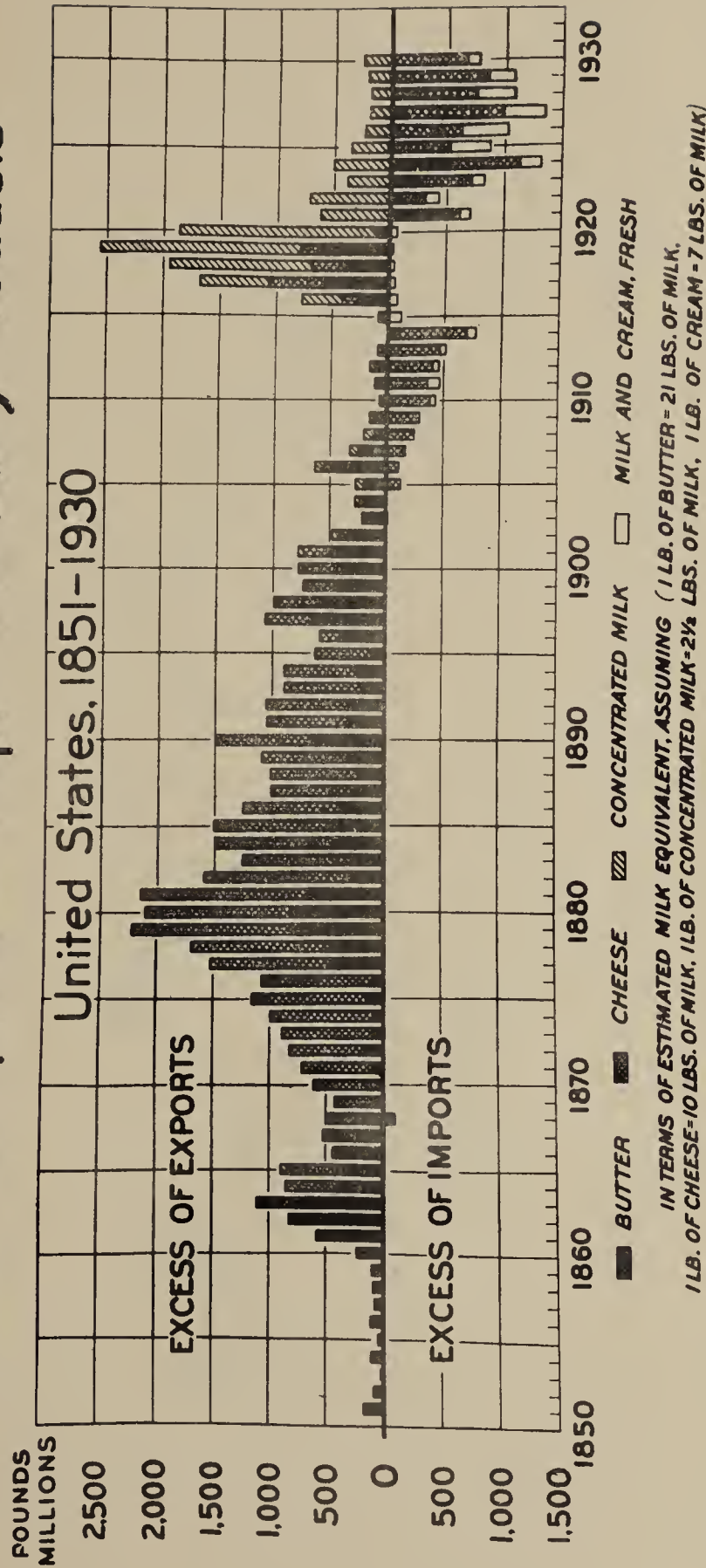
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FIGURE 25 - IN TIMES OF DEPRESSION WHEN INCOMES OF CONSUMERS ARE LOW EXPENDITURES FOR BUTTER AND CHEESE ARE REDUCED. PRICES MUST BE REDUCED IF THE SAME VOLUME IS TO BE MOVED INTO CONSUMPTION. PRIOR TO THE DEPRESSION, EXPENDITURES ROSE FASTER FOR BUTTER THAN FOR CHEESE, AND WHEN THE DEPRESSION CAME EXPENDITURES FOR BUTTER FELL FIRST. WHEN BUSINESS IMPROVES CONSUMERS CAN BE EXPECTED TO INCREASE THEIR EXPENDITURES FOR THESE COMMODITIES, AND WILL EITHER TAKE LARGER QUANTITIES AT THE SAME PRICE OR WILL BE WILLING TO PAY HIGHER PRICES FOR THE SAME QUANTITIES



Excess of Exports or Imports of Dairy Products

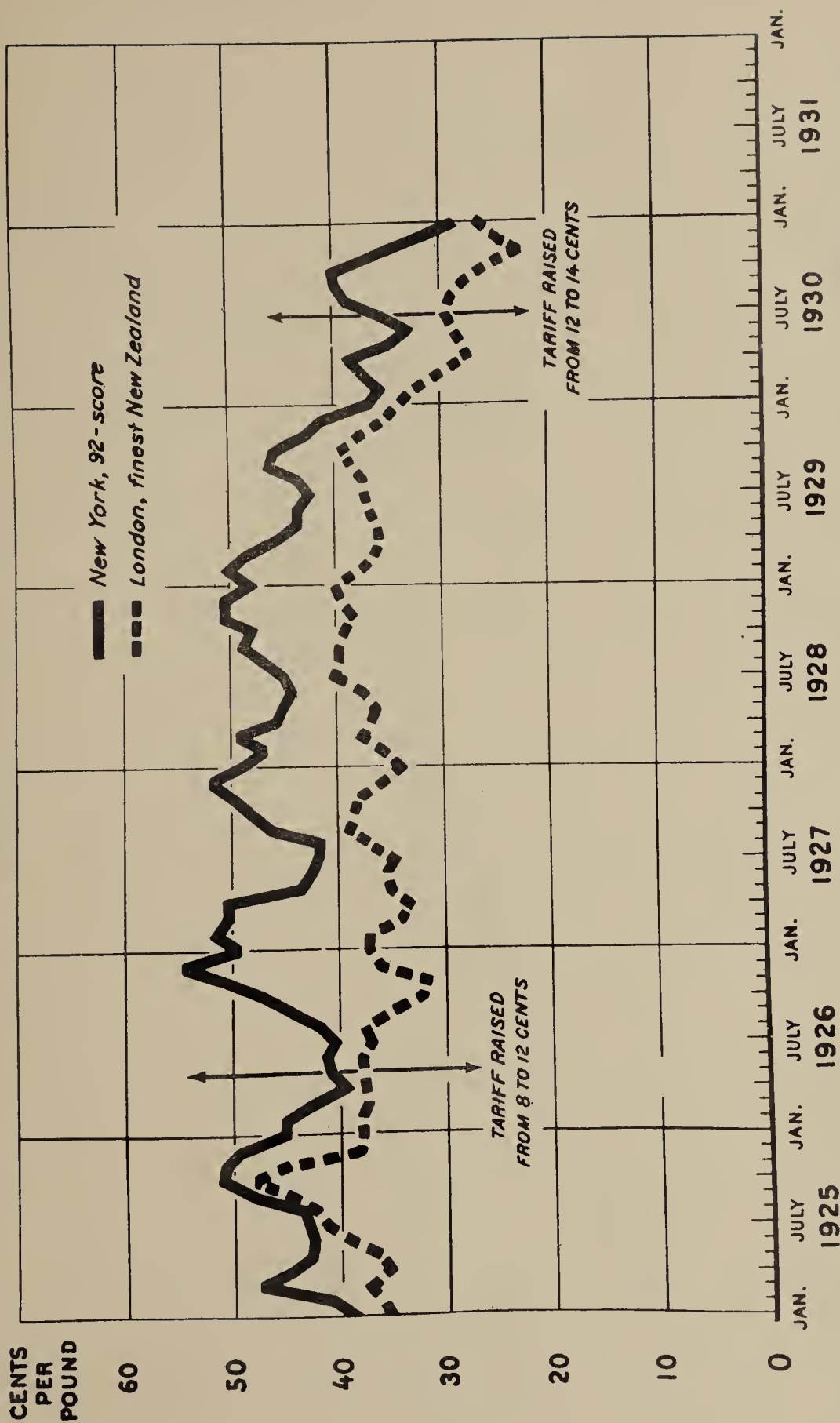


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FIGURE 27 - TOTAL EXPORTS OF BUTTER AND CHEESE REACHED A PEAK AROUND 1880 THEN DECLINED GRADUALLY UNTIL 1914. LARGE QUANTITIES OF DAIRY PRODUCTS PREDOMINANTLY OF CONCENTRATED MILK WERE EXPORTED DURING THE WAR. SINCE THE WAR IMPORTS HAVE EXCEEDED EXPORTS. CONCENTRATED MILK HAS COMPRISED THE BULK OF THE EXPORTS. IMPORTS HAVE BEEN MAINLY OF CHEESE, ALTHOUGH IMPORTS OF FRESH CREAM AND MILK WERE OF CONSIDERABLE IMPORTANCE UNTIL VERY RECENTLY

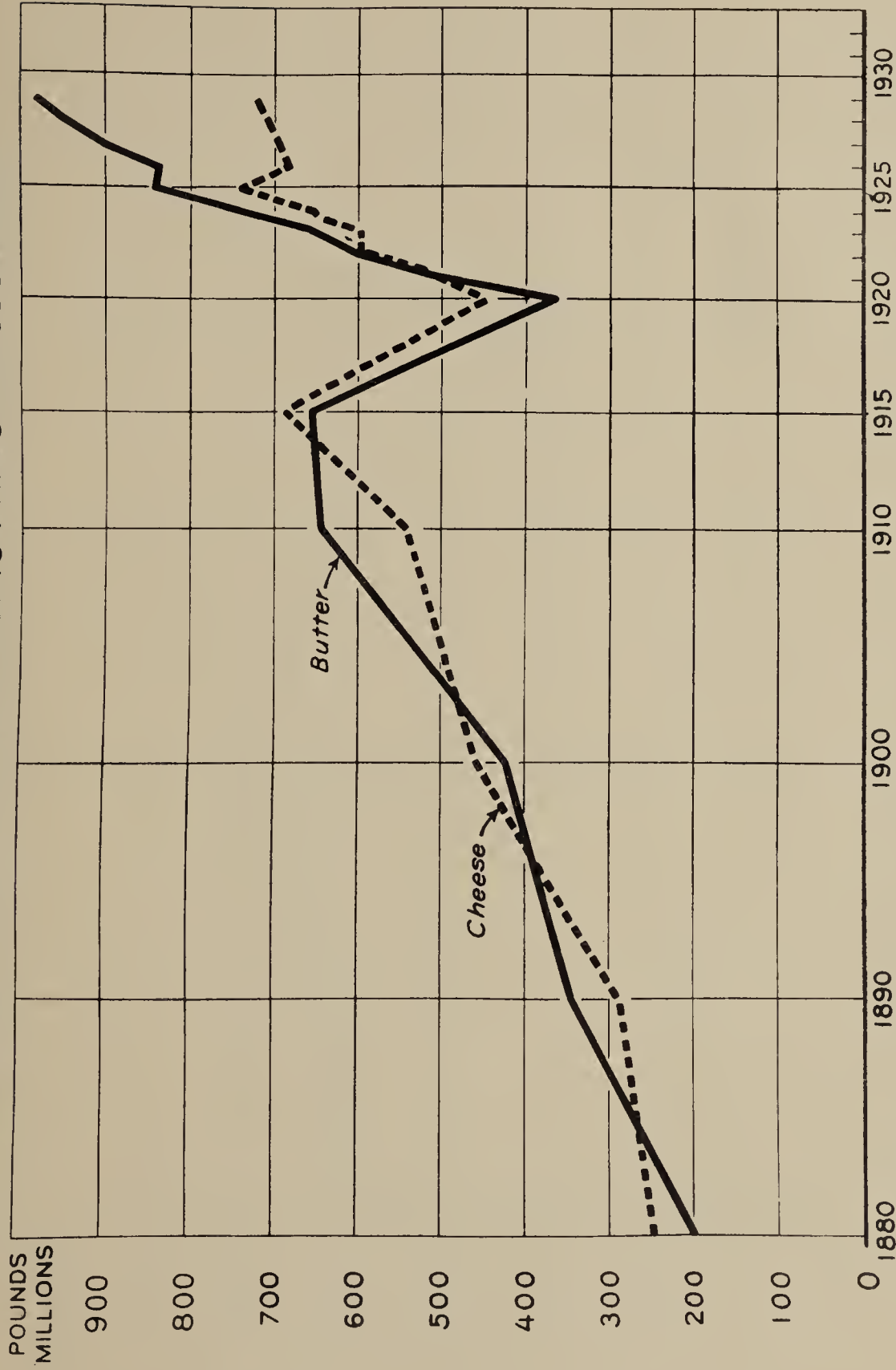
BUTTER: MONTHLY AVERAGE PRICES IN NEW YORK AND LONDON, 1925-1930



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FIGURE 28 - AS COMPARED WITH PRICES OF FINEST NEW ZEALAND BUTTER IN LONDON, NEW YORK PRICES ON A SIMILAR GRADE HAVE BEEN HIGHER BY A CONSIDERABLE PART OF THE IMPORT DUTY. THE RECENT DECLINE IN PRICES HAS BEEN MORE MARKED IN NEW YORK THAN IN LONDON, AND THE MARGIN OF DOMESTIC OVER FOREIGN PRICES HAS NEARLY DISAPPEARED

BUTTER AND CHEESE EXPORTS OF 16 PRINCIPAL COUNTRIES

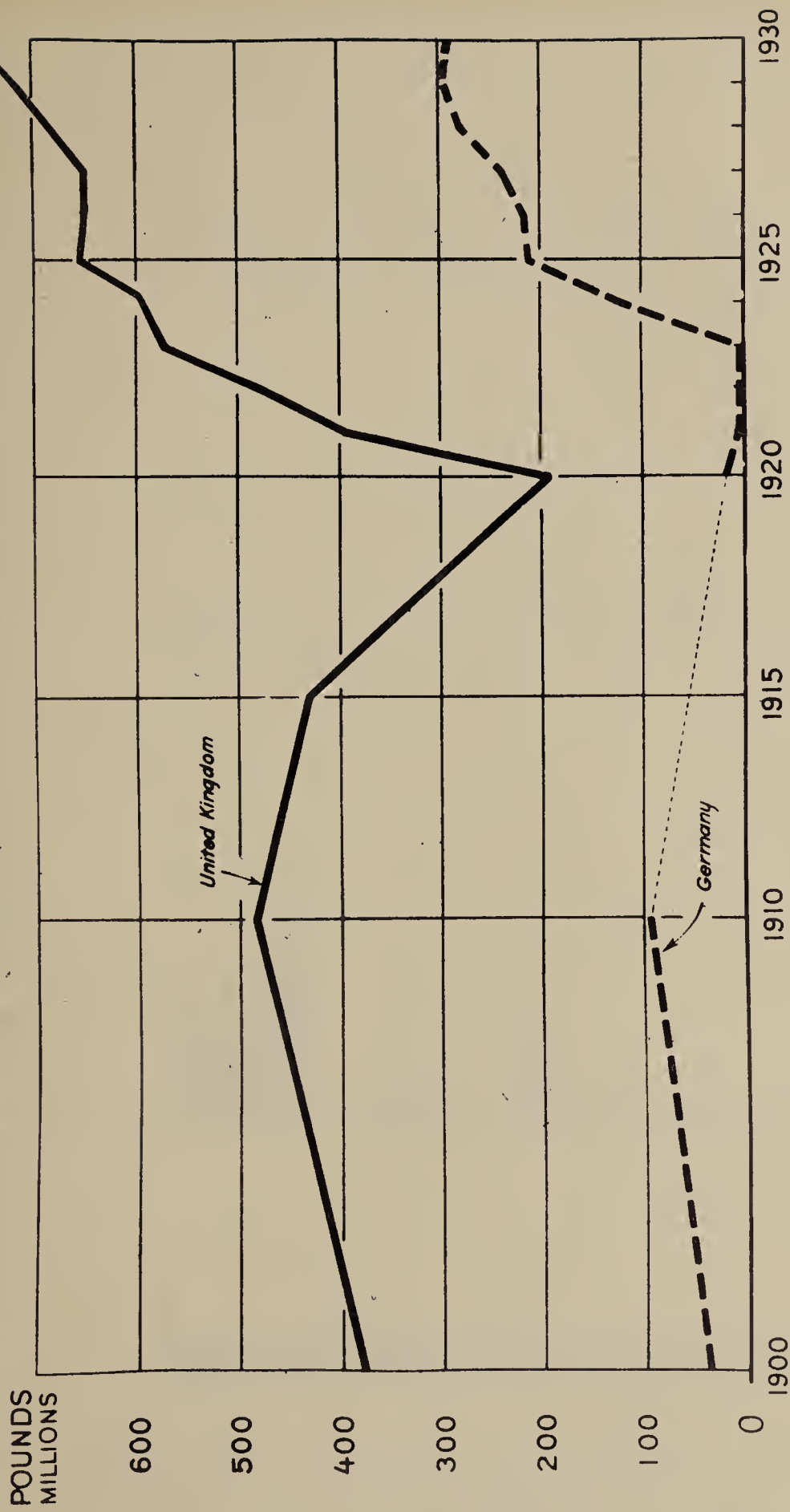


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FIGURE 29 - TOTAL EXPORTS OF BUTTER AND CHEESE FROM 16 PRINCIPAL COUNTRIES FURNISH AN INDEX TO WORLD COMMERCIAL PRODUCTION. THESE EXPORTS HAVE A PRONOUNCED UPWARD TREND. SINCE THE INTERRUPTION CAUSED BY THE WAR, THE TREND HAS BEEN SHARPLY UPWARD ESPECIALLY FOR BUTTER. THIS HAS RESULTED IN A CONTINUOUS PRESSURE ON THE AMERICAN MARKET

IMPORTS OF BUTTER INTO THE UNITED KINGDOM AND GERMANY

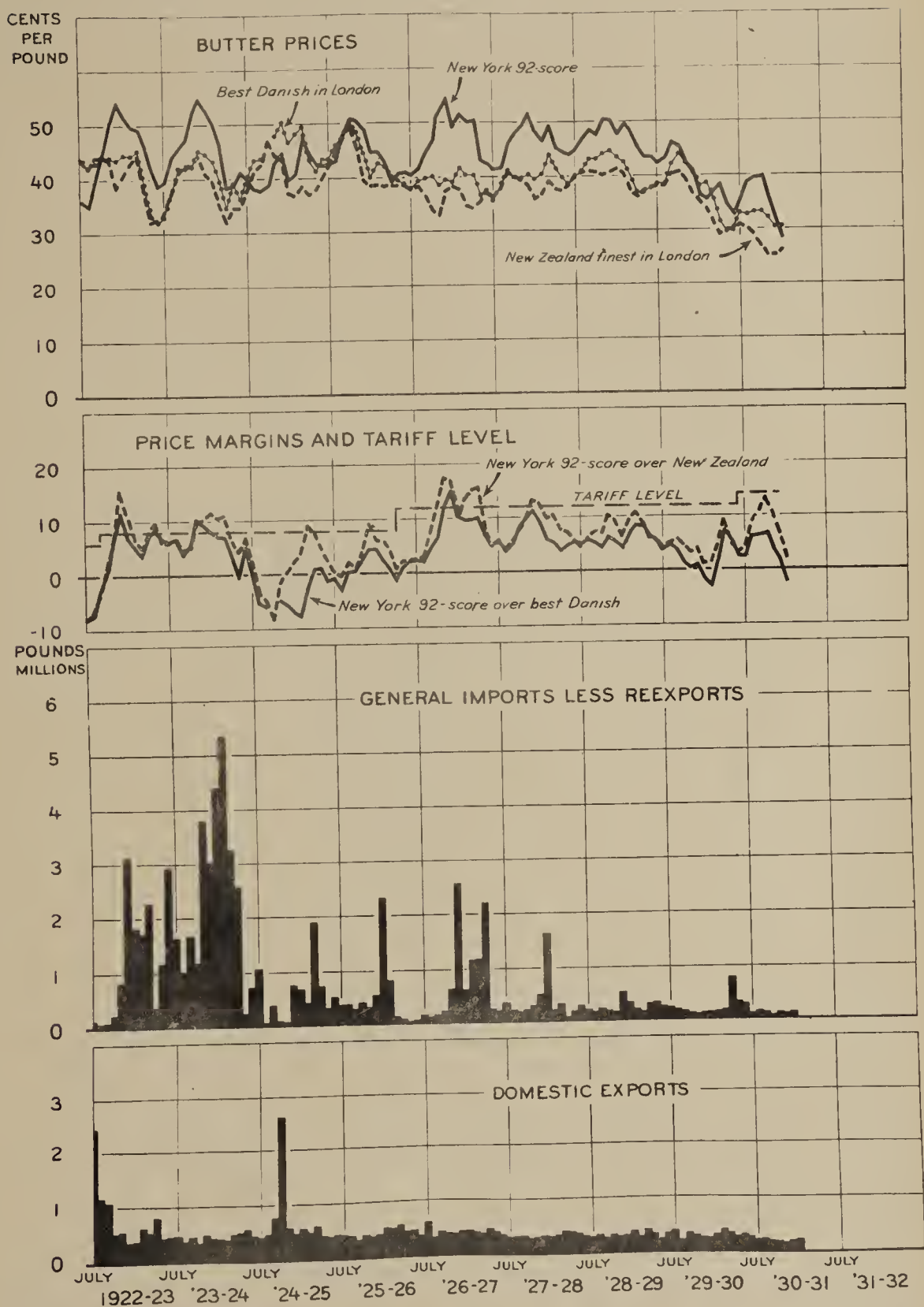


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FIGURE 30 - THE UNITED KINGDOM AND GERMANY ARE THE PRINCIPAL DEFICIT BUTTER-
PRODUCTION AREAS OF EUROPE AND THEIR IMPORTS CLOSELY REFLECT THE WORLD'S COM-
MERCIAL SUPPLY. FOR A TIME DURING AND AFTER THE WAR, GERMANY WAS VIRTUALLY OUT
OF THE MARKET FOR FOREIGN BUTTER, BUT HAS SINCE RECOVERED TO A NEW HIGH LEVEL
OF IMPORTATION

BUTTER: PRICES, PRICE MARGINS, TARIFF LEVEL, IMPORTS, AND EXPORTS

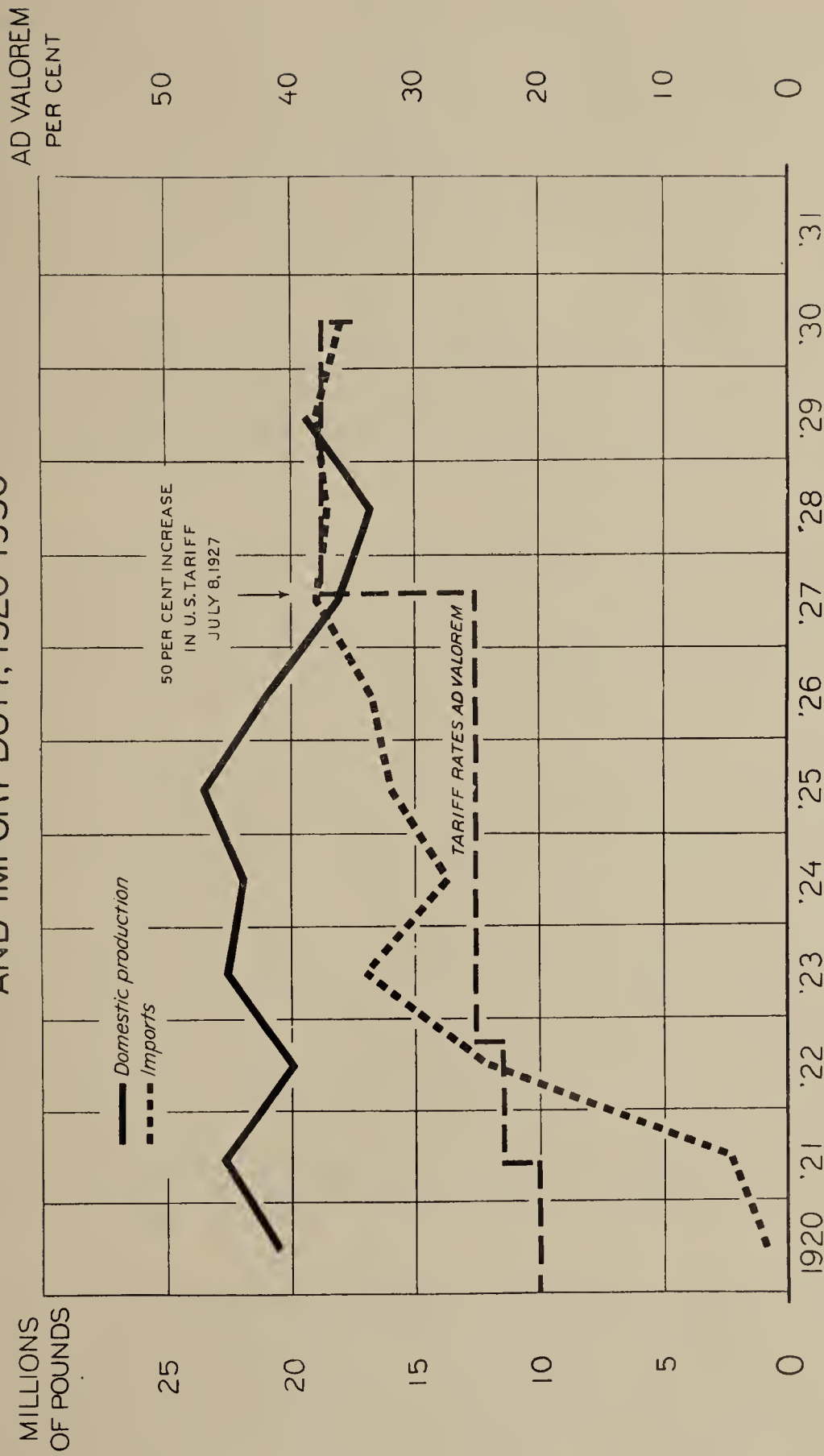


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FIGURE 31 - BUTTER IMPORTS AND EXPORTS TEND TO FLUCTUATE IN VOLUME DIRECTLY WITH RELATIVE PRICES IN DOMESTIC AND FOREIGN MARKETS. SINCE THE WAR BUTTER HAS BEEN IMPORTED WHENEVER THE PRICE MARGIN OF DOMESTIC OVER FOREIGN PRICES HAS BEEN ABOUT EQUAL TO OR IN EXCESS OF THE PREVAILING TARIFF RATE. BUTTER HAS BEEN EXPORTED WHEN FOREIGN PRICES MATERIALLY EXCEEDED DOMESTIC PRICES

SWISS CHEESE: UNITED STATES PRODUCTION, IMPORTS FROM SWITZERLAND, AND IMPORT DUTY, 1920-1930



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FIGURE 32 - CHEESE IMPORTED FROM SWITZERLAND IS DIRECTLY COMPETITIVE WITH PRODUCTION OF THE SWISS OR EMMENTHAL VARIETY IN THE UNITED STATES. IMPORTATION TENDED TO INCREASE MORE RAPIDLY THAN DOMESTIC PRODUCTION UNTIL THE IMPORT DUTY WAS RAISED 50 PER CENT IN JULY 1927. IMPORTATION APPEARS NOW TO HAVE BEEN CHECKED AND DOMESTIC PRODUCTION TO HAVE BEGUN TO RECOVER

PART II READJUSTMENTS IN THE DAIRY INDUSTRY IN THE UNITED STATES
Response of Farmers to Changing Conditions

The present low prices of dairy products may be expected to result in some significant readjustments in dairy production in various parts of the United States. There are two points of view from which we may consider readjustments in the production of any farm commodity. The first is from the historical point of view and is based upon a study of farmers' customary reaction as indicating at least a probability of what their reaction to similar conditions in the future may be. The other point of view is that of determining the rational readjustments that should be made in view of all of the elements in the present and prospective future situation.

Because of the greater amount of data available and the greater ease with which the relationships of past reactions may be seen, discussions of readjustments have been predicated for the most part upon historical studies. We shall start from that point of view here, covering for the most part the decade between 1920 and 1930, and then try to identify the important elements in the present situation which should be considered in shaping future adjustments.

Let us first consider the trends in dairy production for the country as a whole during the last decade. For lack of completely dependable figures we take certain indications as presented in Figure 1, which shows in the curve at the top the production of creamery butter from 1919 to 1930 inclusive. This indicates a rapid rise in production from the earlier date to about 1927 after which production has held fairly constant.

The next indicator is the number of cows on farms as estimated by the United States Department of Agriculture. This shows a substantial increase during the first half of the decade followed by a diminution for the next three or four years after which there was a fairly rapid increase to the end of the period, as indicated by the number on farms January 1, 1931.

Finally, as reflecting the intentions of farmers with relation to the number of dairy cows, there is plotted the ratio of heifers one to two years old on farms to the number of dairy cows, year by year. This is presented in the lowest curve of Figure 1. It will be noted that the fall in this ratio precedes by some little time a corresponding fall in the total number of dairy cows. The slight drop between 1930 and 1931 in this figure seems to indicate an intention on the part of farmers to check the recent expansion in the number of cows, if not actually to reduce the total number. The trend in population for the United States also appears in this chart as a matter vitally related to the expansion of the dairy industry.

We wish, of course, to find some explanation for the changes just noted in the dairy industry during the period under consideration. One general motive always at work is the demand for dairy products. Other things being equal, the growth in demand will be roughly approximate to the growth in population. There is no doubt about the substantial expansion in the total dairy output during this period. However, it is obvious that this output has not kept closely in step with the rather steady growth in population. The increase in production has been at various rates during different years. One of the factors on the demand side which affects this is changes in purchasing power of the consuming public. The recent drastic decline in prices is probably due more to reduced purchasing power of consumers than to expanded production.

The actual or potential gross income of farmers is an important consideration governing changes in dairy output. This is brought out in Figure 2 which represents a rough calculation of farmers' gross income for the United States as a whole and for Iowa. Over against this, in the lower part of the chart, is set a representation of the percentage increase or decrease from each preceding year in the output of creamery butter in the important butter-producing regions represented by 10 Middlewestern States. For every year since 1918 there has been an increase in the output of creamery butter from this region with the exception of 1920 when there was a slight decrease from the 1919 volume. It will be noted that the lowest point in purchasing power for farmers was reached at the same time with the maximum increase in creamery butter production over the preceding year. Also this rate of increase has in general declined during the period from 1921 on, which period until recently was marked by a gradual recovery in the purchasing power of farmers.

In other words, with a much reduced gross income, the farmers of this western butter region have found it necessary to depend to a larger and larger extent upon dairying to supplement their reduced incomes from other sources. This is an important consideration in gauging the probable reactions of farmers to dairy production and to dairy prices. It seems probable that dairying, more generally than any other farm enterprise, is resorted to in times of depression as a means of meeting current expenses and bridging over periods of depression. It will be remembered that the milking of cows and the use of the hand separator was resorted to very generally by grain farmers during the decade of the Nineties when all grain prices were at a minimum. A similar general resort to dairying was one of the conspicuous developments in States like Nebraska, Iowa, and North Dakota during the depression following 1920, as shown in Figure 2.

Another factor influencing the volume of output of dairy products is the ratio of the price of feeds to the price of butter and other dairy products. Figure 3 indicates this relationship as it has worked out during the last ten years in terms of the ratio of butter prices to a roughly approximated grain ration. With the exception of 1918-1919 the relationship is very marked and in the direction that would be expected. With a cheapening in the price of feeds relative to the price of butter, production of butter has increased and vice versa. Were it possible to measure this in terms of fluid milk output we would probably find even a closer relationship, inasmuch as in the leading fluid milk producing areas feed costs are much more a matter of direct cash outlay than in the butter territory. It is significant that at present, in spite of the low price of butter and other dairy products, feed prices are still lower relatively and the conversion ratio still favors production of dairy products.

Having considered the trends in dairy production from the point of view of the country as a whole we need now to turn to the regional aspects. First let us get before us a picture of the geographic differences in the farm price of dairy products. Figure 4 shows by States an index of approximate milk prices to producers, based on the average for the period 1924 to 1928 in which 100 represents a weighted average for the United States as a whole. The minimum price is received in Nebraska and the maximum in certain eastern and southern states. On the whole, the lowest prices are to be found in those states in which butter production dominates the dairy industry and the highest prices in the

highly specialized fluid milk territory. Note upon this map the division of the country into groups of States. This grouping will be made the basis of further discussion to bring out regional trends.

With these regional variations in the prices of dairy products before us, let us turn our attention to the trends in production by different groups of States as reflected by the estimated number of dairy cows during the decade under consideration. These are presented in Figure 5. In the upper-left-hand portion of this figure are charted by simple curves the changes in dairy cow numbers for three regions in which the movement has on the whole been similar. The North Atlantic region includes all of the New England and Middle Atlantic States. It embraces by far the most important fluid milk areas of the United States and includes the densest concentration of nonagricultural population. Although changes in the dairy industry as reflected by the number of cows on farms is not quite the same in all of the States of this region, the exceptions are minor and the general trend is evident. From 1920 until 1927 there was a distinctly downward trend in the number of dairy cows, after which there was an upward movement. Figure 6, which shows these same data by individual States, indicates that this movement characterized approximately all of the States of this region except Maryland, Delaware, and Connecticut.

The Southeastern region shows an approximately similar movement. The high point in number of cows was reached in 1922 and the low point in 1927, with a substantial increase since that time.

The Central South region including the States of the eastern half of the lower Mississippi Valley, together with Oklahoma and Texas, roughly approximating the western and northwestern portion of the Cotton Belt, shows a movement different from that of the other two regions inasmuch as the drop in the earlier part of the period was not so marked and the low point was reached a year earlier. Then it is noticeable that the increase has been at a higher rate and the number in 1931 is higher than at the beginning of the decade, which is not true of the other two regions.

In the lower left-hand corner of Figure 5 two regions are represented which manifest a distinctly different trend. They embrace the butter-producing phase of the dairy industry. In contrast to the regions already cited these two showed a marked upward trend during the first half of the decade, reaching highest points in 1925 and 1926; thereafter they showed a slight decline ending in 1929; after this the upward trend was resumed. Evidently quite different sets of influences have been at work in these two regions as contrasted with those in the three regions first described.

In the upper right-hand corner the single region designated as the eastern Corn Belt is shown. The variations here have been much less than in all the other parts of the country and, although showing more similitude to the butter regions than to the fluid milk regions, the movement shows the results of a combined set of influences, some of which are important in production of fluid milk and some in butter production.

The last set of curves, those representing the Western States, is represented in the lower right-hand corner of Figure 5. These curves indicate that in the Western States dairy production has expanded more rapidly and more consistently than in other parts of the country. This expansion has been greater in the Mountain States than in those of the Pacific Coast.

Having these regional differences in the trend in cow numbers before us as reflecting perhaps better than any other single figure the differences in the shifts of dairy production between 1920 and 1930, let us try to account for the varying regional developments that have been indicated. Anyone looking at the dairy industry in 1925 would have said that there was a significant and probably permanent shift in it, out of the eastern and southern States and into the middle States and the far West. The rapid rise in the number of dairy cattle from Chicago west, and the tendency more and more to supply each consuming center from the western portions of the respective milk sheds, seemed to indicate that competitive conditions were, for the most part, against the dairy producer in the hay and pasture portions of the country and in favor of the producer in the important grain States. However, developments beginning with the middle of the decade indicated that this might be only a temporary shift. In fact, the eastern and southern States have shared fully as conspicuously in dairy expansion since 1927 as have the other portions of the country. They were, indeed, expanding the number of their dairy cattle in years when the butter-producing areas were slightly decreasing theirs.

The first question to ask is, Why did New England, the Middle Atlantic States, and the South decrease their production during the first half of the decade while the Middle West and far West were increasing theirs? There was, of course, a complexity of forces at work in different parts of the country. We may isolate one or two factors in the East and South which were probably of dominant importance. The years of the World War saw a spectacular development of the manufacture of condensed and evaporated milk in this country. Several new factories were established in the New England and Middle Atlantic States and with a very favorable export outlet this industry was at the height of its prosperity in about 1919. Thereafter, with the shrinkage of the export outlet, this industry had to wane and it was natural that the areas with highest feed costs should suffer most severely. Condensed and evaporated milk manufacture in the New England States fell away rapidly following 1920. Likewise creamery butter manufacture, which was of some importance in most of these States up to 1920, and which probably utilized more milk from that region than did the milk canning industry, also felt the effects of serious competition in the cheap feed areas, and the output of creamery butter in these States was rapidly reduced.

In other words, under the conditions of prices and costs that established themselves in the early years of the decade, the Northeastern States found it necessary to restrict their dairy operations more and more to the basis of the fluid milk and sweet cream requirements of their urban population. The contrary situation prevailed in the Western States. Here with cheap feed, and with need of supplementing income from usual sources with increased sales of dairy production, the industry had a rapid expansion. Later, when the prices of beef cattle, hogs, and other important farm commodities of this region improved, the emphasis upon dairy production was reduced and cows kept for milking were reported in somewhat smaller numbers after 1926.

The situation in the South, where dairying has always been of minor importance, was affected very largely by the dominant crop, cotton. In the earlier years of the decade the ravages of the boll weevil had led farmers in some measure to resort to dairying. With readjustments in the location of cotton acreage, the improved price of cotton, and discovery of methods of weevil control, cotton again asserted itself as the main source of income with the resulting decline in the number of dairy cattle. With the increase in cotton acreage in the western part of the Cotton Belt and the consequent decline in price of cotton, the eastern South found it necessary to look for other enterprises with the result that the number of dairy cattle was again increased.

The Eastern Corn Belt is a region of relatively cheap feed but is tributary to a considerable urban population and contains such centers as Detroit and Cleveland where the population has grown rapidly. The dairy industry in this region has become more and more dominated by the fluid milk trade; hence although the trend in the number of dairy cattle resembles more nearly that in the butter regions than in the fluid milk regions of the East, the upward trend in number of cows has not been so great.

The dominant element determining the trend of dairy cattle in the Western States is probably the growth of urban population in the Pacific Coast cities. Because of great distances and high transportation costs, this region as a whole tends to be self-sufficing in terms of dairy products. Not only do the near-by dairy areas supply the necessary fluid milk and cream for the rapidly-growing cities of the coast States but the region as a whole finds a market for its butter in these cities and very little is either shipped in or shipped out of this region.

To note the direction and nature of the changes in the dairy industry, State by State, during this period one may refer to Figure 6 in which the number of dairy cows is plotted for each State. Considered State by State some exceptions may be noted from the trends indicated in Figure 5 for the regions. Nevertheless, the general situation as indicated above is borne out by the State figures.

Changes in the trends of dairy production are due, of course, to changes in plans made by individual farmers. Change in the price of the product is only part of the motive for such changes. The producer is interested as much in the profit he can make as in the actual price he receives for his product. The price factor to which the farmer might be expected to react is the price of milk relative to the cost of producing milk. Since the most important variable factor in the cost of milk production is the cost of grain and concentrated feed, the producer may be expected to react in a more definite manner to changes in the milk-grain ratio than to changes in the prices received for his product or the relative price of less important factors.

In Figure 7 the results of three studies that show the producers' reaction to changes in a milk-price grain-feed ratio is summarized. In this chart the vertical scale represents the quantity of milk shipped per shipper or individual producer in terms of an average normal to a central receiving plant through the winter season. The horizontal scale represents a 24-month average milk-grain ratio in per cent of an average normal. The three diagonal lines represent the average relationship which has been found to exist between the relative price ratio and the quantity of milk shipped per shipper in the three regions studied.

In general, when the milk-grain ratio is low--that is, when the price of milk or butterfat is high relative to the price of grain--the quantity of milk shipped per shipper increases; when the ratio is low the quantity of milk shipped decreases. This means that the producers in these three regions watch their feed costs in relation to milk prices and vary the intensity of their feeding somewhat as the price-ratio changes from time to time. The relationship as charted is the total influence of changes in the price ratio upon changes in production. This total, however, can be broken down into three rather distinct influences; first, a short-time influence; second, an intermediate influence; and third, a long-time influence.

When the price of milk or the milk-grain ratio suddenly changes the producer is likely to adjust by a partial cut or increase in the quantity of grain fed, so that the influences through the first two or three months is relatively small.

If the situation continues, the farmer may make certain decided shifts within five to nine months. He may markedly change his rate of feeding and he may change the number of cows milked. Through a still longer period of time, a still more marked adjustment may be made since the farmer may save a larger-than-usual number of young calves and thus increase the size of his herd two years later.

Remembering then that the three curves of relationship charted in Figure 7 represent the combined short, intermediate, and long-time influences of changes in the feed ratio upon changes in milk production, let us consider them in more detail. The most elastic of the three is the Richmond curve; the least elastic is the Twin Cities curve. Why these differences?

A part of this difference is probably due to the number of shippers included in the study. In the Richmond study the shipments of 50 continuous shippers through a 10-year period was considered. In the Baltimore district the shipments of 1,200 shippers through a 7-year period was studied and in the Twin Cities study the shipments of all members of the Twin Cities Milk Producers Association through a 7-year period was considered. Since the variation in smaller units is likely to be more marked when expressed in terms of normal than the variation in much larger groups where the smaller-unit variations will tend to offset to some extent, the general order of elasticity shown by the three curves is to be expected.

A second reason for the different slopes of three curves may be found in the fact that in the Richmond area the greater portion of the grain is purchased and the type of dairying is distinctly commercial; in the Twin Cities area a great many of the farmers raise their own feed; in the Baltimore area an intermediate situation prevails.

A third reason for the differences may be that the Twin Cities farmers have several alternative livestock enterprises upon which a change in grain price may be expected to operate while the Baltimore and the Richmond producers are much more limited in their alternatives.

Another question may now be asked: What proportion of the variation in milk supplies can be explained through the milk-grain price ratio? When the milk shipments considered in these three studies were corrected for average seasonal changes, approximately 75 per cent of the remaining variation was explained by the ratio analysis when the winter period alone was considered.

When the summer period is analyzed, however, the relation is not so close since milk production per cow during the summer depends not so much on the quantity of concentrated feed received as upon the kind and extent of pasture available.

The trends in dairy production, both in the past and presumably in the future also have close relationship to what is happening in the production and values of other farm commodities with which they are associated or may be associated in the farm production program. Some of the effects of changes and regional difference in the price relationship between feeds and dairy products have been cited. Quite as important are the relations between dairying and other lines of production which might take the time of the farmer or the land he uses in producing dairy feeds and handling the dairy herd. In some instances, less of dairying means more of some other enterprise, and vice versa. In other cases the relation is such as to make dairying and some other enterprises rise and fall together.

Beef cattle production and dairying are very closely associated. The degree of this association varies greatly as between regionals. In the New England States, and for the most part throughout the fluid milk areas, beef cattle occupy a very minor position and the great bulk of the cattle stock upon farms is of the specialized dairy breeds. This tends to be true also in the more highly specialized butter States like Wisconsin. On the other hand, a very large percentage of our total dairy output comes from areas where there is no sharp line of demarcation, at least on the use basis, between dairy cattle and beef cattle. The usual assumption is that in the latter type of territory the relationship between dairy production and beef production is necessarily a competitive one. The farmer, it is assumed, tends to shift the use of his cattle from the production of young stock to sell as beef to their use primarily for milking, or vice versa, depending largely on the relative price of beef and of dairy products. It is assumed that when beef prices are favorable the dual-purpose herds of the Middle West will not be used to a great extent for milking, or at any rate the milk flow from those regions will be decidedly smaller than when beef cattle prices are low relative to butterfat prices.

Let us examine certain data in order to determine what has been the actual relationship between these two closely associated uses of the cattle. Figure 8 is designed to show this relationship for the country as a whole. The total number of cattle on farms is indicated by the curve at the top of the chart. The bars at the bottom indicate factory-butter production for the United States as reported by the Census. The period covered is 1898 to 1930.

This period includes two major cycles in cattle numbers. From 1900 to 1904, while cattle prices were increasing rapidly because of a stimulating price situation, the increase in butter output was relatively slow. In the following years, however, when cattle numbers were decreasing because of overproduction, lower prices, and a consequent liquidation process, there was a somewhat higher rate of increase in butter production. The second cycle, beginning with 1912, shows this tendency in a more striking way. From 1912 to 1918 cattle were increasing in numbers in response to favorable prices.

At the same time butter and cheese production was increasing very slowly. Following the peak, however, there was a long period of liquidation induced by falling cattle prices and during that period there was a very rapid increase in the national output of butter and cheese.

Thus far the examination seems to bear out the common assumption that if beef cattle prices are favorable a reduced emphasis will be given to dairy production, particularly by those who are in position to produce beef. But it should be noted that while the curve representing the number of cattle rises and falls, reflecting substantial changes in the total number of cattle in the country, the comparisons at the bottom show always an upward movement. In other words, butter and cheese production has never gone backward but has increased at varying rates. Each successive cattle cycle has evidently left dairy production at a permanently higher level.

Let us make similar comparisons on the basis of certain important butter-producing States. Figure 9 shows for Wisconsin the same things as were shown in Figure 8 for the country as a whole. It is a specialized dairy State, outside the region of most abundant corn production, and it has a pasture and cropping system particularly conducive to dairy production. We find that the number of cattle in the State has not followed the national trend but has established, rather definitely, a trend of its own. There have been no major reductions in numbers but rather a fairly steady upward climb. Likewise the production of butter and cheese in this State has been more steadily upward than for the country as a whole. The levelling off, indicated since 1923, coincides with the cessation of increase in cattle numbers as well as being affected in all probability by an increasing demand for fluid milk occasioned by the growth of population in the Chicago and Milwaukee metropolitan areas.

Iowa, on the contrary, displays quite a different cattle trend and a somewhat different showing in the production of butter and cheese. Cattle numbers in this State are evidently affected by about the same set of factors that determines the rise and fall in cattle numbers for the country as a whole. At least in the past it has been predominantly a beef cattle rather than a dairy State. There was a marked liquidation during the declining phase of the cycle beginning near 1900; and although following 1912 there was not the marked increase and decrease in numbers displayed for the country as a whole, nevertheless the cycle is clearly discernible. Here, again, the increase in butter output was least marked in periods of rising cattle prices. In fact, in both the early cycle and the later one, there was a slight actual decline as shown by the Census figures. The striking thing is the substantial increase in butter production during the past period of beef cattle liquidation dating roughly from 1921 forward.

The question still to be settled relates to the repetition of these relationships in the future. Evidence points to a growth in the number of beef cattle during the next few years. Will the relatively favorable beef cattle prices, which are expected to obtain, put an effective check on the expansion in butter production for the country as a whole? This must be answered in terms of what is likely to happen in the various regions

The fluid milk region will have its output gaged largely by increase in population and per capita rate of consumption. It would seem reasonable to expect Wisconsin to continue its expansion on the basis of butter, cheese, and fluid milk, to the extent that agriculture in general may expand in that State. It is not so clear as to what is likely to happen in Iowa and similar butter-producing States where dairying, up to the present, has occupied a minor position compared with meat animal production. It is hardly to be expected that there will be a reduction in butter output in view of all of the elements in the present and prospective future situation. Prices of alternative products are not so favorable as to make for a gross income large enough to relieve the pressure upon dairy production as an important supplementary source of income. It is characteristic not only of the western Corn Belt but of the older portions of the wheat belt that when depressed prices of the more important commodities reduce incomes alarmingly, dairying has been resorted to as an emergency measure. To a considerable extent the future volume of dairy production in these regions depends upon the extent to which readjustments in other parts of the country and the world, in other important farm enterprises, bring about a readjusted price situation that will relieve the farmer of his present urgent need of income from whatever emergency source is available.

Somewhat outside the above considerations, although closely related to them, is another set of conditions having to do with changing farm practices and cropping programs. The Middle West and the South contain large acreages of land which up to this time has been used for cropping and which because of low prices of products and depleted soil fertility, will in the future probably be used to a much larger extent for pasture and hay. In addition, there are large areas of permanent and semi-permanent pasture now of very low productivity which can be improved substantially by methods well known and demonstrated to be successful. In addition to these, in the areas where the very best soil and surface predominate an increasing need of legume crops to restore organic matter and prevent the depletion of the soil is leading to the introduction of highly productive legume crops such as sweetclover over which may be utilized incidentally as very productive pasture. All of these changes, both actual and potential, carry with them the possibility of a substantially expanded general cattle enterprise. This in turn makes, potentially at least, for a generally expanded dairy production through the dual use of a larger number of cattle. How far this development will go and how much it will affect the volume of dairy output, will depend upon the economic pressure exerted through price relations for supplementing the other sources of income in the regions affected.

Another important influence on the future expansion of dairying is the price of grains, particularly the feed grains. With the present ratios unquestionably in favor of dairy production in the cheap-feed areas, but little contraction can be expected; and a continuation of such relations will probably figure as an influence toward further expansion, particularly in the cheap-grain areas. There is little in sight, at present, to indicate a general decrease in feed crop production relative to that of other crops. On the contrary, with improved crop production technique it is likely that the pressure of feed crop production will continue strong. This is likely to exert the pressure already referred to toward measurably expanding dairy output along with that of other animal products.

With conditions in the various regions approximately as described, the urgent question is, What can be expected in the way of readjustments and price conditions in these various regions within the next two or three years?

It seems clear that the northeastern fluid-milk-producing region can not retain its present status with reference to the number of dairy cows and volume of output under the present levels of prices and costs. The increase in number of cows in this region during the last few years seems to indicate that prices of the various products were such as to encourage an increase in dairying to the extent not only of supplying a growing demand from the fluid milk trade itself, but for the supplying of cream and the production of a considerable seasonal surplus going into by-products such as condensed milk and butter. With the reduced retail price of milk in various cities of this region, together with the increased surpluses due to declining consumption of cream and milk, average prices to farmers have been greatly reduced. This will inevitably lead to the curtailing of production to approximate the volume required for the highest-priced uses, namely, the retail fluid trade. Undoubtedly pressure will be exerted by organized producers to raise the price of basic and surplus milk. The degree of success of these efforts will depend primarily upon the extent and speed of business recovery. At this time the outlook over the next year and a half does not look particularly bright in that direction.

On the other hand, the Middle West, with cheaper feed and a much lower proportion of the total costs of dairy production in the form of actual cash outlay, is in a much stronger competitive position. Further, the reduced income from other sources, as already pointed out, is putting additional pressure upon farmers for increased milk production. Wisconsin, Minnesota, Illinois, Iowa, and portions of the surrounding States, where feed normally is abundant and where excellent pastures can be provided, will in all probability expand their dairy output during the current season and thereafter. Such expansion is made the more easy by the large amount of dairy stock on farms and the ability to increase this stock substantially by holding back the marketing of aged cows and by saving additional heifers.

Indications are that the number of beef cattle will increase throughout the Middle West, particularly in the western portion of the Corn Belt where grain and roughage are most abundant. If relations between this development and the dairy industry were to parallel past experience, we would find at least a marked slowing up in the increase in dairy output through these areas, particularly in such States as Iowa and Nebraska. But the present situation is not normal. The low prices of other products, including hogs and grain, put the farmers in real need of supplementary income. We may expect that at least as high a proportion as at present of the cows of beef and dual-purpose breeding will continue to be milked until farm income from other sources shows improvement. Further, the changes already cited, which characterize western Corn Belt cropping systems, are likely to change the nature of the cattle enterprise from less emphasis upon commercial feeding to more emphasis upon a combination of cattle growing and milking. Although there is probably no reason to believe that the rate of increase in dairy output through this region will be as rapid in the next three years as it was between 1922 and 1928, a substantial increase may well be expected.

Almost certainly the farmers of the wheat regions, so hard-pressed by the recent declines in wheat prices, will turn to the milking of more cows this year and next because of dire need for more income. The total net increase from this source will be in the form of butter and will not be great. Nevertheless, it may be significant in view of the present condition of the dairy market..

In view of the continued low price of cotton and the urgent demand for more income in the South that region is likely to continue in a moderate expansion of its dairy output. Here, again, production from this source is not of great volume but it may have its effect upon the price of butter.

The Western States, including both the Mountain and Coast groups, will probably continue to expand somewhat more rapidly during the next few years because of the low prices of other products including wheat, sugar beets, beans, fruit, and sheep. It is to be expected, however, that they will continue to keep their dairy output in somewhat close adjustment to the consumer-demand within their own borders.

All in all, the increases to be expected from the various southern and western regions are likely more or less evenly to balance the decreases in the highly specialized fluid milk territory of the Northeast. Any improvement in price therefore within the next year or two is likely to depend almost entirely upon a strengthened demand arising out of whatever improvement may be looked for in business conditions, bringing with it a reduction in unemployment and a higher per capita consumption of milk, cream, and butter.

All of the foregoing suggestions as to future development in the dairy industry have reference to the two or three years just ahead. The important problem in terms of long-time developments is to be found in the relation of total supply to domestic demand for all dairy products, as this relation may affect future dairy prices. We are just now virtually on an export basis for butter in high contrast with the conditions existing during the last ten years when domestic butter prices have, with minor exceptions, ranged well above London prices for comparable grades. Diminished demand and expanded production within our own borders have brought about a condition which has eliminated, for the time being, the advantage secured from tariff protection. Is our dairy industry to stay in this position or are we to have an adjusted output such as to bring back our price advantage on butter with its tendency to affect favorably the whole dairy industry?

Much depends upon the degree to which demand is restored with changes in employment and business pickup. It also will depend upon recovery in other phases of American agriculture which may to a greater or less degree remove the pressure from the dairy industry. All things considered, it would seem that we may look for modest though appreciable recovery of prices within the next three years. But taxes, interest, and other fixed charges will remain high and will continue to exert pressure on the farmers of many of our agricultural regions in the direction of milking more cows. All in all, the long-time outlook for dairying seems not to be dismal; but there is call for the adoption of economical and efficient practices to the end of meeting moderately low prices with low production costs.

Some Essentials to Dairy Farm Efficiency

The foregoing discussion shows how dairy production has varied in response to economic changes. It also points to the probable future shifts in dairy production by regions within the near future. It is worth while to discuss briefly some ways in which the individual farmer may modify his own plans to meet the new situation. If prices are not going back to their old levels under which dairy farming experienced its development during the last ten years, those farmers who can find no better alternative and therefore will continue dairy production, or those who because of depleted income from other sources find they must increase their dairy production or take on dairying as a new enterprise, must meet the situation by greater efficiency and lower costs of production.

Research workers in the fields of dairy husbandry, agronomy, and farm engineering have pointed the way to methods and adjustments designed to enable farmers to realize lower costs. It is the function of the farm management worker to point out how, under specific conditions, these various methods may be incorporated into the organization of individual farms in the most effective manner. A few illustrations of specific improvements with suggestions as to how farmers may take advantage of them are here presented.

Wisconsin Bulletin 417 issued last September reports the results of experiments which show that a maximum volume of production from good dairy cows can not be maintained through the use of ordinary clover hay. It shows that in comparison alfalfa hay is much more effective in maintaining maximum output. Since maximum output per cow is one of the most important considerations in low costs, this bulletin suggests one direction toward meeting present-day price conditions. It calls for a consideration of possible adjustments of cropping systems on such farms as are not already producing alfalfa with a view of replacing other hay with alfalfa. On many dairy farms clover and timothy mixtures are sown with small grain and allowed to carry over as a hay crop the following year, after which the field may be used for pasture for a year or two before it is put back into corn, followed again by small grain. Thus the hay crop is a part of the general crop rotation. frequently it seems desirable to change this system to take hay out of the regular rotation by setting aside a portion of the land for a semi-permanent alfalfa hay meadow since it is not usually desirable to plow up an alfalfa field after one or two years of use. Another consideration is the condition of the soil. Soil which shows an acid reaction will not produce alfalfa successfully. The farmer therefore has the question of an added cost in the purchase of lime. He must weigh these additional costs and the trouble of readjusting his cropping program against the fairly long-time advantages of having a better hay. In all probability this adjustment to alfalfa production would be a paying one for large numbers of dairy farmers over considerable portions of the dairy producing regions.

The selection of sources of concentrates, particularly the protein in the ration, becomes a consideration of added importance when dairy product prices are low. If the higher priced protein feeds tend to carry the costs to a figure too high to be compensated for by the lower priced product, frequently adjustments can be made by selecting protein-bearing

feeds of lower cost which will meet the emergency and enable the farmer to continue producing at something of a margin. Probably under present conditions wheat and oats are the cheapest sources of protein. Due consideration, of course, must be given to the effectiveness of these feeds and the way in which they will combine with the other elements in the ration. Another important consideration is the rate of feeding. It has been found that on most farms there is a tendency to over feed low producing cows and to under feed those of high capacity. Greater care in adjusting the size of the ration to the physical productive capacity of the individual cow will mean greater efficiency.

The Federal Bureau of Dairy Industry and the state experiment stations have been working for many years in the study of the rates of production by individual cows. Upon the results of this work they have based policies of effective selection and culling of dairy herds. In this period of low priced dairy products it is of utmost importance that the results of these studies be utilized fully in the culling out of low producers and in the purchasing of cows by those who plan to enter the dairy industry or to expand their present dairy enterprise.

Throughout large areas of the western Corn Belt and the wheat regions, where indications are that dairying will be maintained at its present volume or even expanded, there are major problems of readjusting the whole farming system in order that this enterprise may bring maximum returns. For the most part, farmers of this region must still continue to pay major attention during the growing season to the production and harvesting of crops. The dairy enterprise tends to interfere with this through a conflict in labor demands. Many of the most enterprising farmers are avoiding this difficulty by having the most of their cows freshen in the fall after the heavy rush of crop work is over. This enables them to concentrate their attention on the dairy enterprise during the late fall and winter when, because of cheap feed and abundant labor, they are able to make dairying an effective part of the farming system. No doubt very much more needs to be done on many farms in this direction.

There is need in these same areas of adjusting the cropping system to provide a better basis for the cattle enterprise. This means introducing high class hay crops such as alfalfa, cutting down probably on the proportion of small grain in favor of highly productive legume pastures in rotation, and in some instances, as available capital will permit, the provision for silage to be included not only in the dairy ration but in the more effective production of the young stock for beef.

A further problem in these regions has to do with the type of cattle to fit the double demand of meat and dairy production. It is probably true that in the long run the specialized dairy breeds will not serve the farmer of this region to best advantage. With the abundance of corn and other high carbohydrate content feeds, meat production will probably continue to be the first livestock consideration. However, the selection of cattle that will combine in best proportions the two sets of characteristics will continue to be an important measure toward greater efficiency and lower costs.

UNITED STATES CREAMERY BUTTER PRODUCTION, JAN. 1 MILK COW AND HEIFER NUMBERS, AND POPULATION, 1920-1931

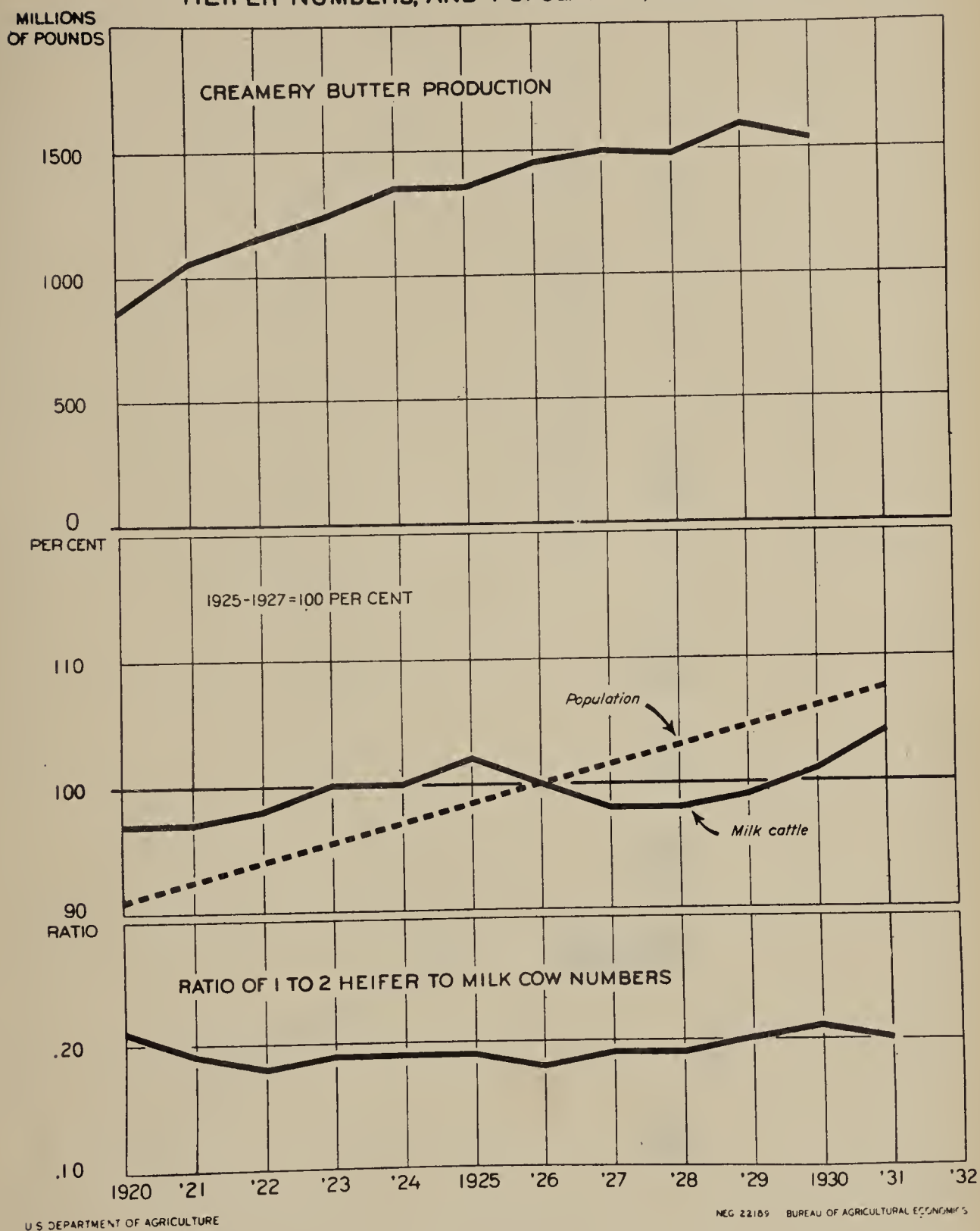
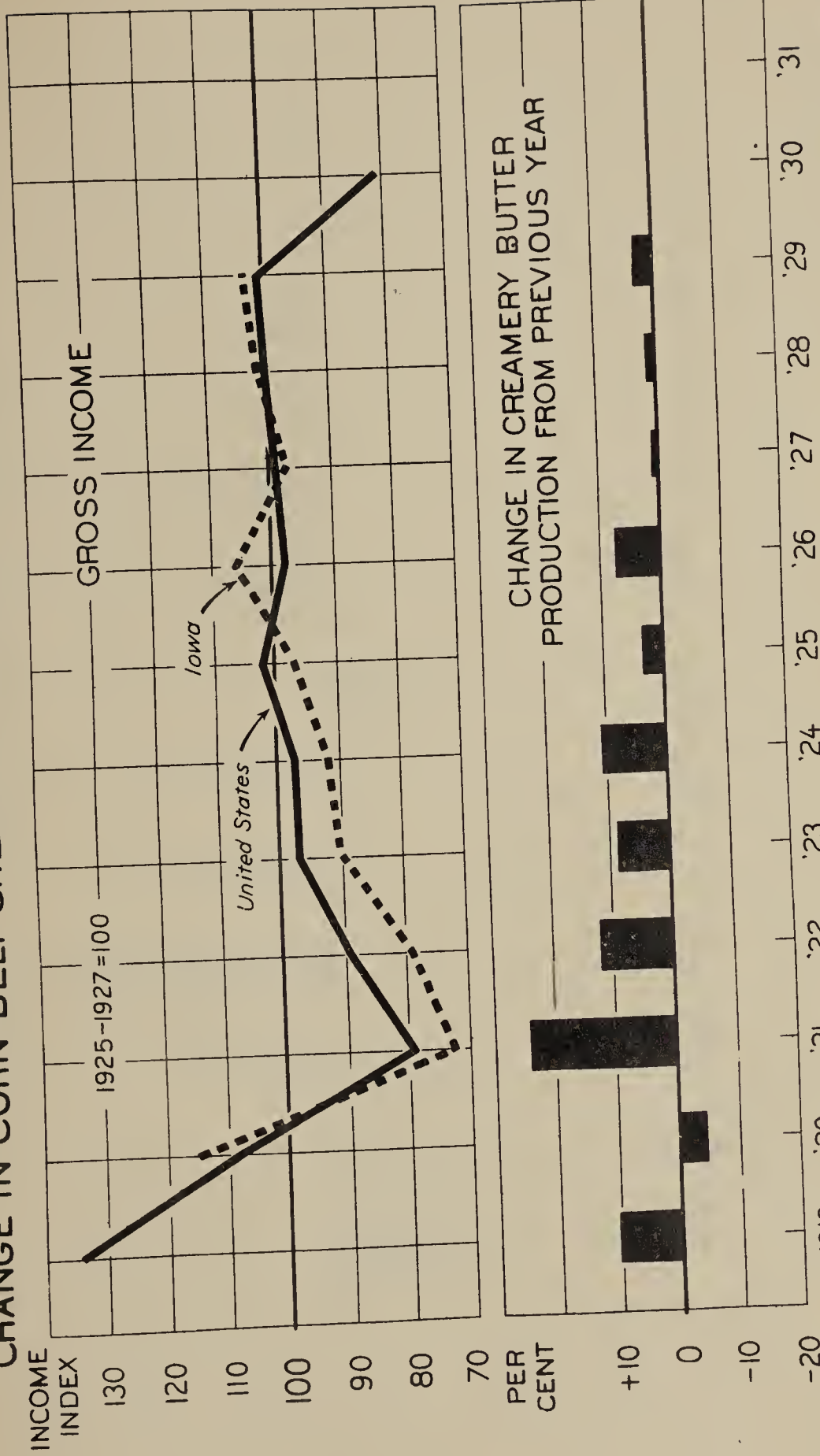


FIGURE 1 - FROM 1920 THROUGH 1930, THE TRENDS IN U.S. CREAMERY BUTTER PRODUCTION, IN MILK COW AND HEIFER NUMBERS AND IN POPULATION WERE ALL UPWARD. THIS INDICATES THAT DAIRY PRODUCTION AND CONSUMPTION HAVE BEEN ABOUT EVENLY MATCHED THROUGH THE PERIOD

GROSS INCOME FROM U.S. AND IOWA FARM PRODUCTION AND RATE OF CHANGE IN CORN-BELT CREAMERY BUTTER PRODUCTION, 1919-1930

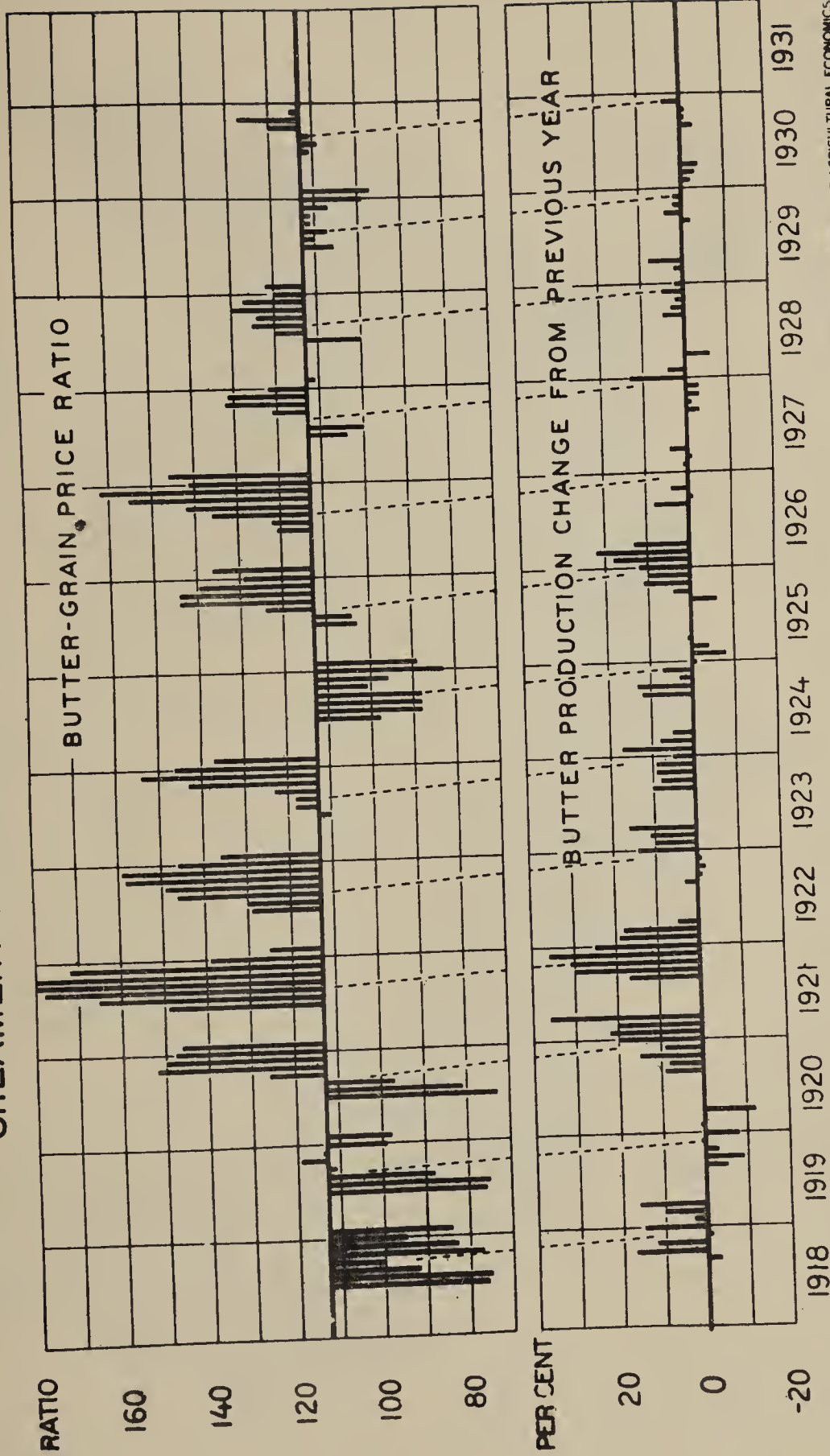


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FIGURE 2 - THE MARKED INCREASE IN THE CORN-BELT CREAMERY BUTTER PRODUCTION IN 1921-1922 CAME DURING A VERY LOW FARM INCOME PERIOD. MANY FARMERS, WHEN HARD PRESSED FOR CASH INCOME, TEND TO INCREASE THEIR DAIRY OUTPUT

BUTTER-GRAIN PRICE RATIO AND THE RATE OF CHANGE IN UNITED STATES CREAMERY BUTTER PRODUCTION, 1918-1930



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FIGURE '3 - WHEN THE PRICE OF FEED IS CHEAP RELATIVE TO THE PRICE OF BUTTER AS IN 1921-1922 U.S. CREAMERY BUTTER PRODUCTION HAS TENDED TO INCREASE AT A RAPID RATE; BUT WHEN FEED IS HIGH RELATIVE TO BUTTER AS IN 1929-1930, PRODUCTION HAS TENDED TO REMAIN UNCHANGED OR DECREASE

INDEX OF COMPOSITE PRICES PAID PRODUCERS FOR MILK DURING PERIOD, 1924-1929

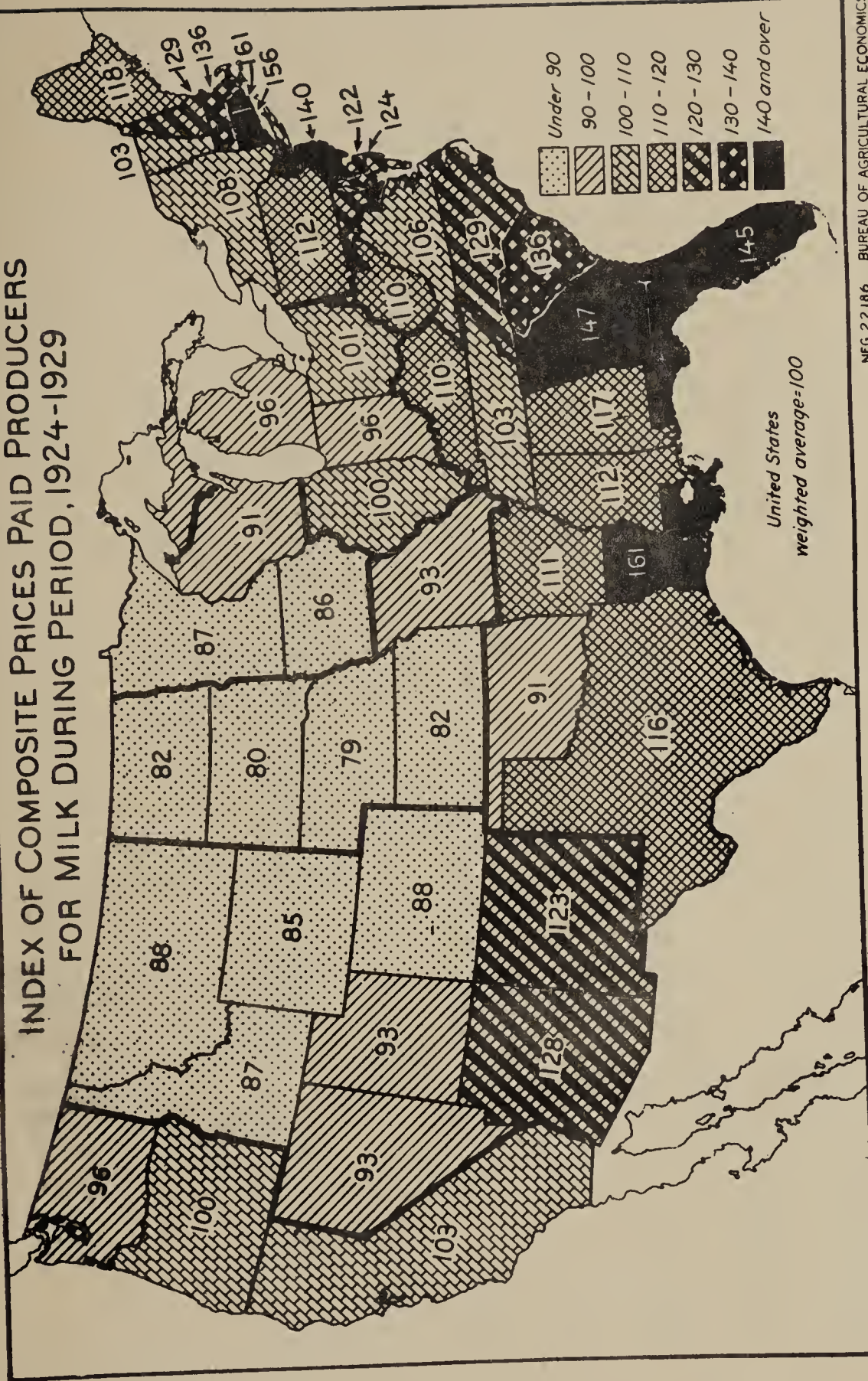
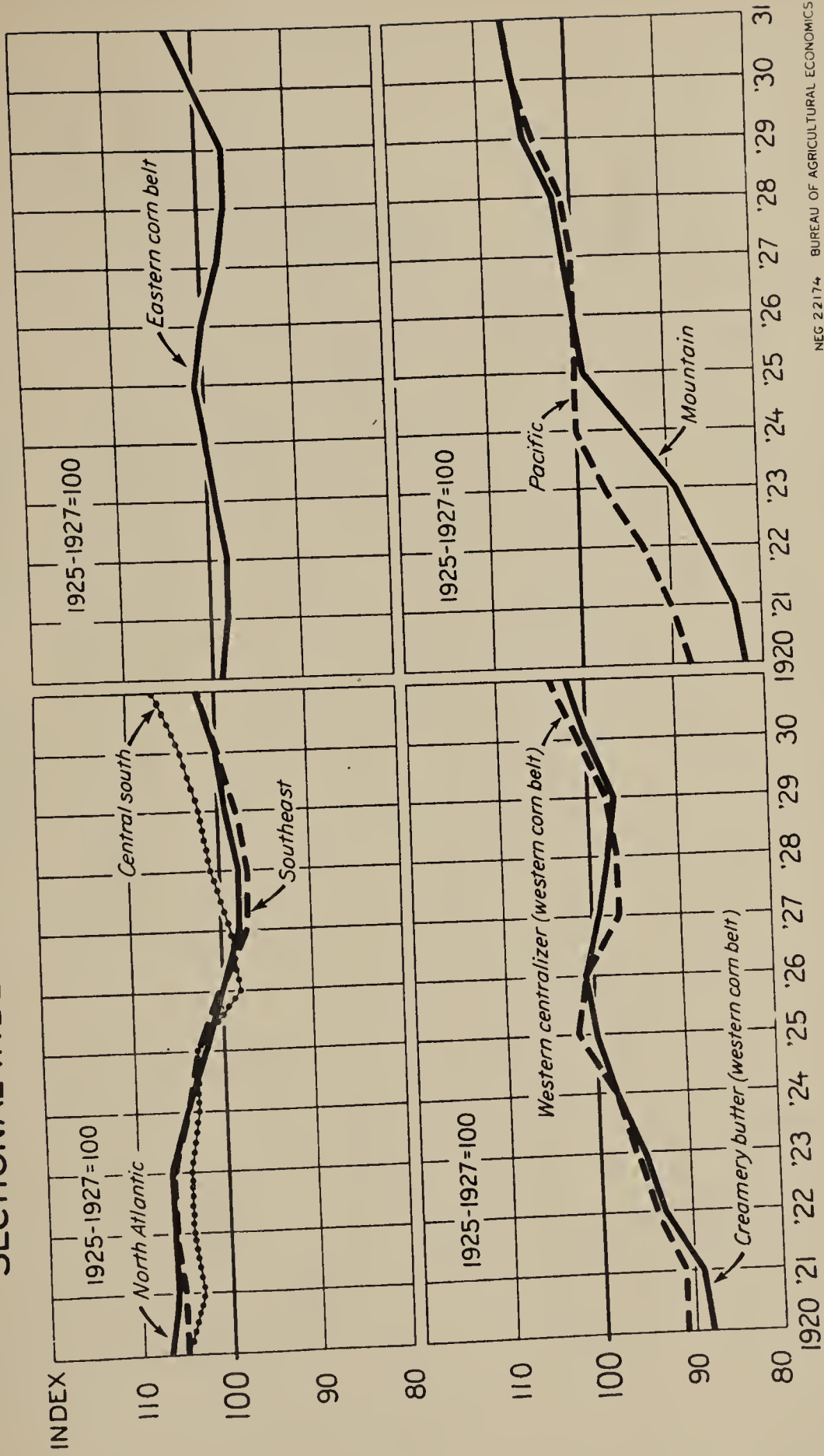


FIGURE 4 - THE COMPOSITE PRICE WHICH PRODUCERS RECEIVE FOR MILK DEPENDS UPON THE PROPORTION OF THEIR MILK USED AS MARKET MILK, UPON THEIR DISTANCE FROM THE CONSUMING MARKET AND UPON THEIR VOLUME OF PRODUCTION. NOTE THAT THE WESTERN CORN BELT IS A LOW PRICE AREA AND THE INDUSTRIALIZED NORTHEAST IS A HIGH PRICE AREA

SECTIONAL INDEXES OF JAN. 1 MILK COW NUMBERS, 1920-1931

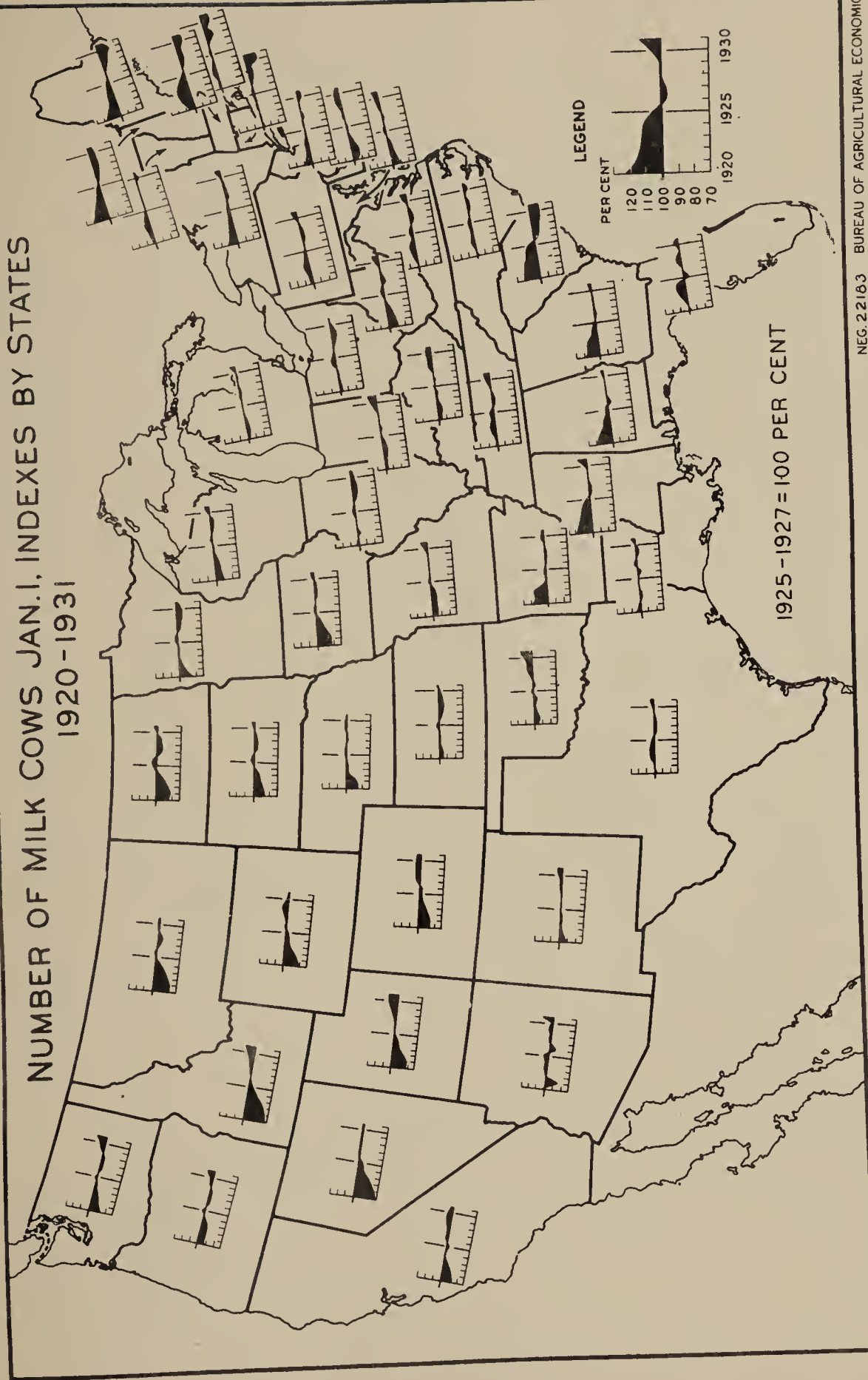


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FIGURE 5 - IN THIS CHART, COMPARATIVE SECTIONAL INDEXES OF JANUARY 1 MILK COW NUMBERS ARE SHOWN. NOTE THE DECREASES IN THE NORTH ATLANTIC AND SOUTHERN INDEXES FROM 1920 UNTIL 1927 IN CONTRAST TO THE MARKED INCREASES IN THE WESTERN CORN BELT, MOUNTAIN, AND PACIFIC INDEXES FROM 1920 THROUGH 1931

NUMBER OF MILK COWS JAN. 1, INDEXES BY STATES 1920-1931

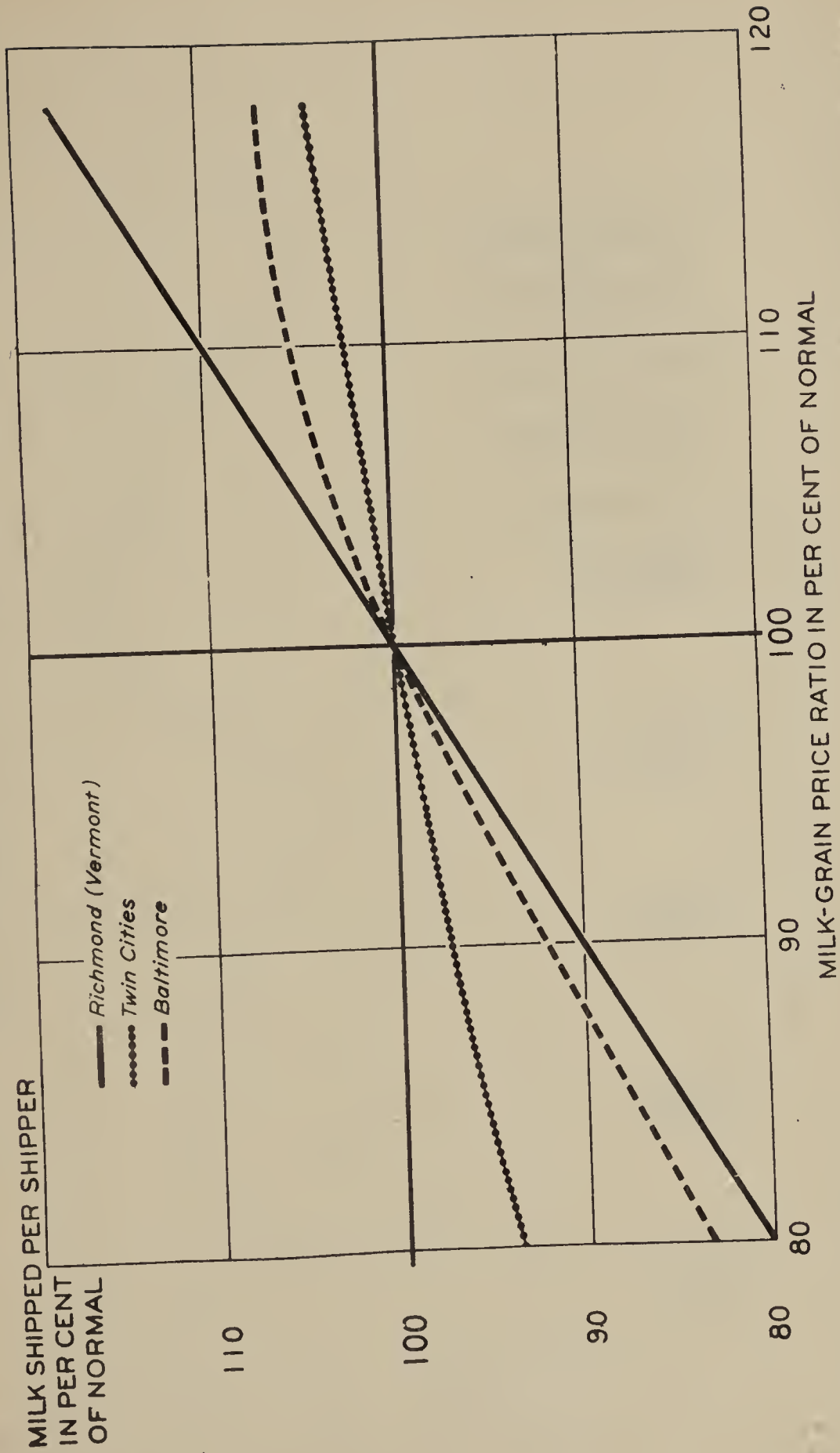


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FIGURE 6 - IN THIS CHART, COMPARATIVE STATE INDEXES OF JANUARY 1 MILK COW NUMBERS ARE SHOWN. NOTE THE GENERAL MOVEMENT TOWARD DECREASED NUMBERS IN THE NEW ENGLAND AND SOUTHERN STATES IN CONTRAST TO THE MARKED INCREASES IN THE WESTERN AND PACIFIC STATES

MILK-GRAIN PRICE RATIO AND THE AMOUNT OF MILK SHIPPED PER SHIPPER IN THE WINTER SEASON IN 3 SELECTED AREAS

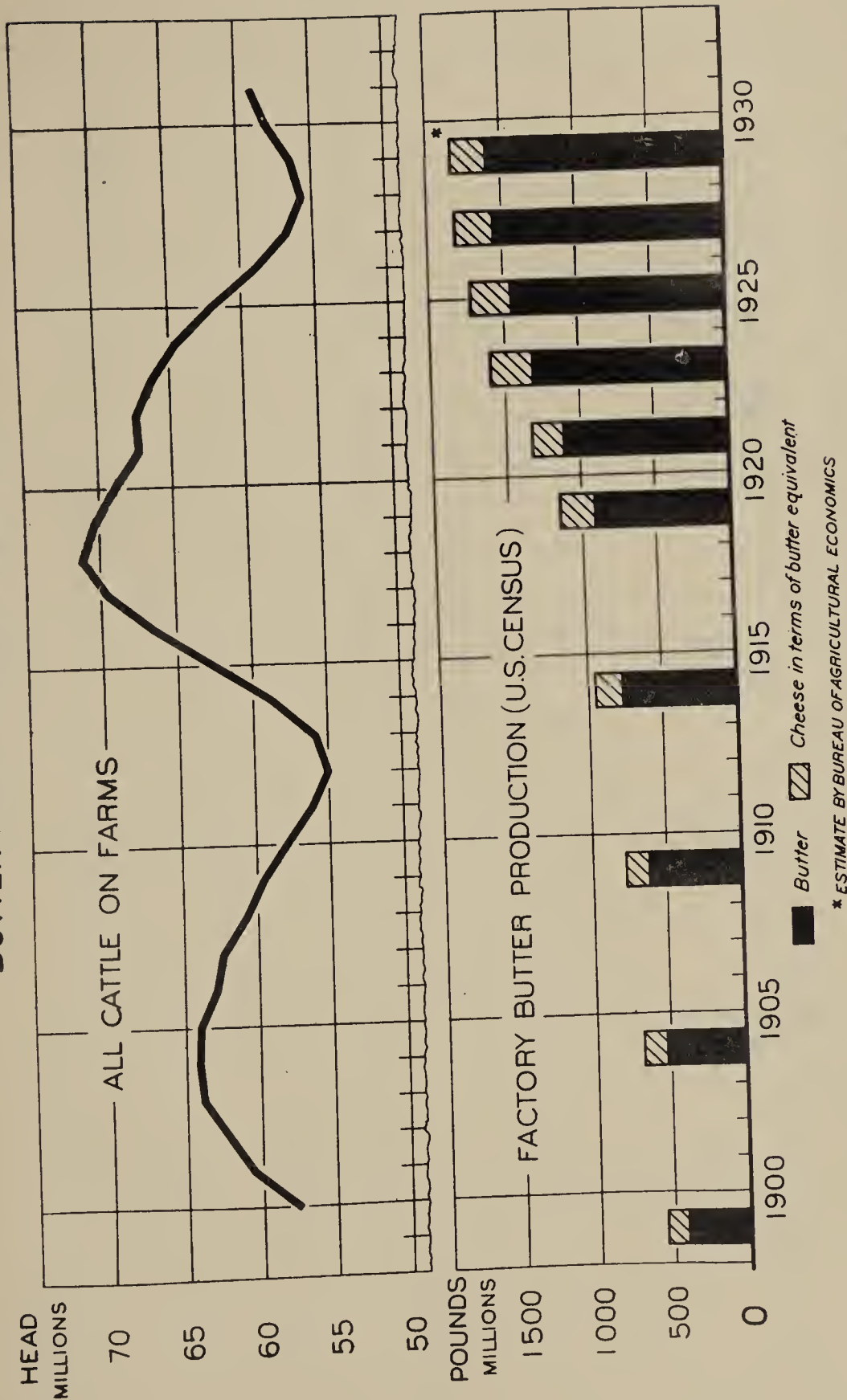


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FIGURE 7 - WHEN THE PRICE OF MILK IS HIGH RELATIVE TO THE PRICE OF GRAIN, DAIRY-MEN INCREASE PRODUCTION AND WHEN THE RELATIVE PRICE IS LOW, THEY DECREASE PRODUCTION. AS INDICATED ABOVE, THIS RELATIONSHIP IS ESPECIALLY IMPORTANT THROUGH THE WINTER SEASON

ALL CATTLE ON FARMS AND U.S. FACTORY PRODUCTION OF BUTTER AND CHEESE, 1899-1931

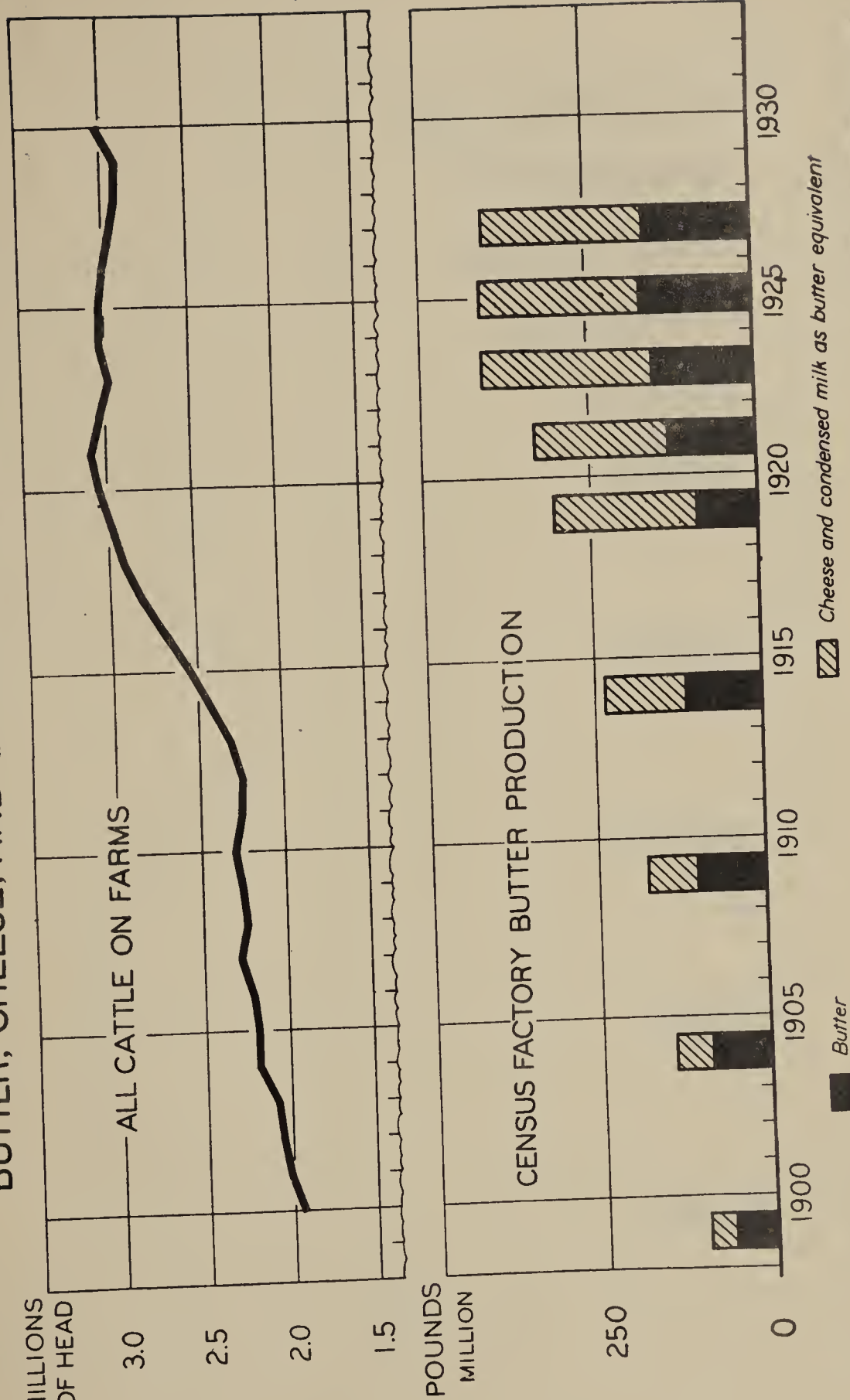


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FIGURE 8 - ALTHOUGH THERE HAVE BEEN TWO DISTINCT CYCLES IN CATTLE NUMBERS SINCE 1899, U.S. CREAMERY BUTTER PRODUCTION HAS STEADILY INCREASED. THERE IS A TENDENCY, HOWEVER, FOR THE RATE OF INCREASE TO SLOW UP WHEN CATTLE PRICES ARE HIGH AND CATTLE NUMBERS ARE ON THE UP-SWING

ALL CATTLE ON WISCONSIN FARMS AND WISCONSIN FACTORY PRODUCTION OF BUTTER, CHEESE, AND CONDENSED MILK, 1899-1930

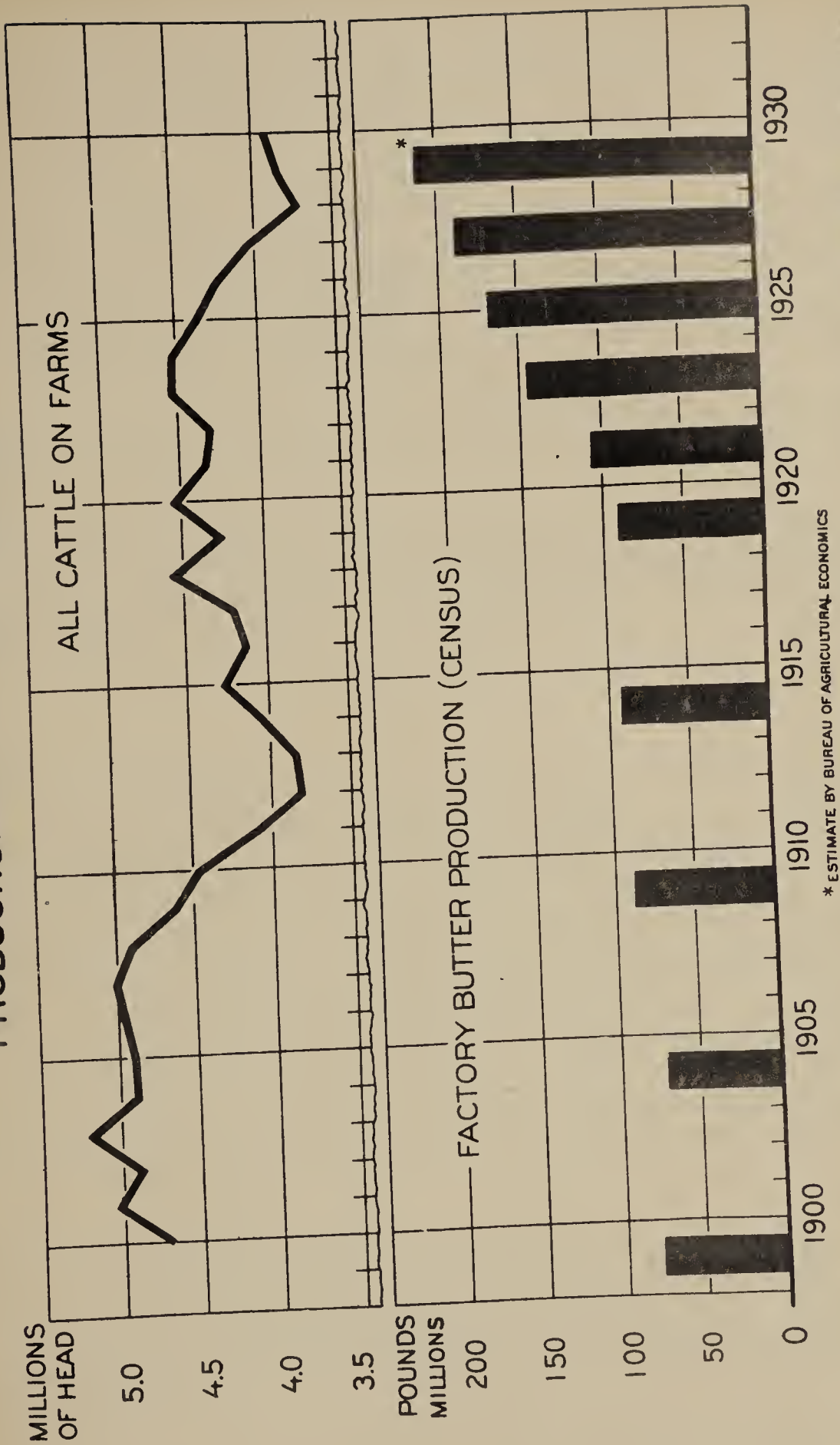


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FIGURE 9 - IN A SPECIALIZED DAIRY STATE LIKE WISCONSIN WITH A FARM PASTURE AND CROPPING SYSTEM ESPECIALLY CONDUCTIVE TO DAIRY PRODUCTION, THE TRENDS IN THE NUMBER OF ALL CATTLE AND IN DAIRY PRODUCTION HAVE BOTH BEEN UPWARD SINCE 1899

ALL CATTLE ON IOWA FARMS AND IOWA FACTORY PRODUCTION OF BUTTER, 1899-1930



* ESTIMATE BY BUREAU OF AGRICULTURAL ECONOMICS

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FIGURE 10 - IN IOWA, WHERE BEEF CATTLE ARE AS IMPORTANT AS DAIRY CATTLE, FACTORY BUTTER PRODUCTION SINCE 1899 HAS REMAINED UNCHANGED OR DECREASED DURING PERIODS OF HIGH BEEF PRICES AND INCREASING CATTLE NUMBERS AND HAS INCREASED DURING PERIODS OF LOW BEEF PRICES AND DECREASING CATTLE NUMBERS

PART III - RESEARCH AS A BASIS FOR EXPANDING THE DEMAND FOR DAIRY PRODUCTS

Until near the close of 1929 the trend of consumption of dairy products had been increasing and prices were rising or holding closely to a general level. The major business depression of 1930 has resulted in a decreased demand and prices of many dairy products have been depressed to or below those of the pre-war years.

The general tendency to increase total production of dairy products has not been greatly slackened, and it is doubtful if the total volume of dairy production will be curtailed or decreased to an important extent as the result of the present business depression. Dairy products prices, however, will be depressed and the demand for dairy products will likely be on a low level until consumer incomes improve.

The results obtained from research studies of demand for dairy products are of interest in that they indicate some of the factors which influence the demand for dairy products.

Research studies of demand for dairy products are rather limited and the field has not been thoroughly covered, nor have many of the studies been as broad in scope as might be desired. In the following statement results obtained through the various research studies, grouped according to different commodities, are briefly reviewed.

MILK

Effect of Price on Consumption.

On the basis of studies in New York and Chicago it appears that aside from consumers becoming accustomed to a given retail price over a long period of time, a one cent change in the retail price of milk has an almost negligible effect on sales and that such a change in price influences sales only over a short period of five or six weeks. An increase in price tends to decrease consumption slightly, while decreases in price stimulate consumption to an even lesser degree. There is some indication, however, that a two cent change in price may have more than a proportionate effect on the sales. Likewise it is possible that after a given price level is reached, an increase in price may reduce sales materially. Indications are then, that within limits the demand for milk is inelastic. However, when a high price level is reached the demand may be highly elastic. Studies available do not indicate whether high elasticity would appear with very low prices - (See 3, 15 and 16 in numbered list of references.)

Effect of Income on Consumption.

Studies in Philadelphia, Austin, Texas, Detroit, four Illinois urban markets, and in selected rural areas of New Jersey, show that consumer purchases of milk are associated with income. In general, per capita consumption varies directly with income though after a given level of income is attained, there appears to be no corresponding increase in consumption, (2, 4, 10, 12, 13, and 17).

A New York study indicates that all grades of milk are not effected to the same extent, (16).

Effect of Availability on Consumption.

In a study of consumption in a rural area of New Jersey, results indicate that the most important factor influencing consumption of fluid milk was availability, per capita consumption being highest for families having cows and not selling milk, next highest in families possessing cows, and lowest in families not keeping cows, (12).

Results of an urban study in Illinois indicated that over a given five-year period, sales of retail quarts increased on an average of 5 per cent each year, while sales of wholesale quarts increased only 1.7 per cent. This difference was attributed to an improvement in retail service and to an increase in the use of household refrigeration, (17).

Effect of Quality on Consumption.

In discussing consumption in Southern cities, it is said "Were people able to get a high-grade milk in the quantities desired, consumption likely would increase", (9)*

In connection with a study of per capita milk consumption in Chicago and two other Illinois cities, results indicated that the high rate of milk consumption in Chicago was indicative of the effect which public confidence in milk quality had upon market demand, it being noted that higher quality appeared to have been associated with an increased per capita consumption, (17).

Results of a Philadelphia urban study indicated that prices, quality, and purpose for which used were important factors influencing grade selection, the higher qualities being used for drinking and lower qualities for cooking. (2).

Effect of Size and Composition of Family on Consumption.

Studies of milk consumption in Washington, Austin, Texas, and in a rural section of New Jersey indicate that per capita consumption decreases as size of family increases (4, 5, 12), though the Washington and New Jersey studies indicated that the decreases might have been due to decreases in per capita incomes, as size of family and income were inversely related, (5, 10).

Philadelphia and New Jersey studies indicated that, in general, per capita consumption appears to decrease as age increases, at least until maturity is reached, (2, 12).

Effect of Season on Consumption.

Most of the studies made in conjunction with seasonal variation on milk consumption or demand are studies of the demand in a particular area.

In general, results show that consumption of milk is relatively stable when considered from month to month, though there is a wide fluctuation as between various types of container. Bulk milk sales reflect seasonal demand for ice cream; wholesale pints, that of the factory workman; wholesale half-pints, that of restaurants and schools; wholesale quarts, that of home consumption through retail stores; and retail quarts direct route deliveries. (14).

(* Figures refer to references at end of paper.)

Ordinarily, from January to June, there is somewhat irregular increases in the amount of milk consumed. With the close of school and the beginning of vacation period, sales fall so that the low point is ordinarily reached about in August. The return of school children and vacationists around the 1st of September causes a second peak in October. In general, it is thought that this seasonal variation is caused chiefly by two factors, vacations and major temperature changes. (3, 15, 16).

Changes in temperature apparently effect demand to a greater extent in summer than in winter, having, roughly, three times as much effect in summer as in winter.

A New York study indicated that sales of certified milk show little seasonal fluctuation. Quarts of Grade A milk, while showing a greater fluctuation than certified milk, do not show as great a fluctuation as quarts of Grade B milk. (16).

Factors Causing Daily Fluctuations in Demand and Consumption.

Total daily milk sales are usually low on holidays. (14). In a Chicago study it is noted that sales of quarts of milk, Sunday and Monday, are the only days which show significant variation from normal, Sunday being high and Monday low; for pints of milk, sales are smallest on Sunday, although Saturday also shows low consumption through wholesale channels. (15).

A New York study indicated that sales of quarts of Grade B milk are slightly higher on Sunday, varying, however, with the section of the city. In business sections sales are lower. Pints are lower on Saturday and Sunday than other days, with the greatest decrease in business sections. (3).

Daily sales are effected by fluctuations in temperature, the relationship being closer for retail milk than for wholesale. Retail quarts are less effected and the sale of pints more effected. Temperature changes have a marked effect on sales of bulk milk. The effects of temperature are particularly striking when there is a sudden drop of 15 or 20 degrees. (15).

Effect of Advertising on Consumption.

A Philadelphia study indicated that the principal medium through which advertising seems to reach the housewife is through schools, though there was some indication that lectures were effective. As to the features which housewives remembered, food value ranked first, quality second, and dealers name third. (2).

Another Philadelphia study indicated that from an advertising standpoint, quality appeals most to native whites, health to colored housewives, and quality and health to the Jewish housewife. In this study, 15 per cent of all housewives reported that they had heard the use of milk advocated through schools while only 8 per cent of the housewives were able to recall other sources. (10). A Philadelphia study also indicated that people drink milk because it is a pleasing beverage, rather than because it has food value or was good for them. (2).

CREAM

Such studies as have been made relate to the variation in demand for cream in the home.

Effect of Income.

The per capita consumption of cream appears to be directly related to income according to the results secured in two Philadelphia studies. (2, 10). A study of consumption in four Illinois market areas indicated that sales of quarts at both wholesale and retail and half pint at retail appeared to be closely related to employment. (17):

Effect of Availability.

In a study of consumption in twenty-nine Southern cities it is indicated that consumption of light cream might be increased were cream of good quality available. (9).

Studies in New York and four Illinois market areas including Chicago indicated that there is a peak of consumption in May and June, with a second minor peak in October. This was particularly true of heavy cream. Light cream showed less seasonal variations, though consumption was found to be heavier in winter than in summer, presumably because of its use in connection with coffee. (3, 14, 16, 17).

Daily Variation.

Studies in New York and four Illinois market areas indicated that consumption of both light and heavy cream are high on Sundays and holidays. (3, 15, 16, 17).

BUTTERMILK

Studies in New York and Chicago indicated that retail sales of buttermilk reach a maximum in the summer, June, July and August being the months of heavy consumption. This variation was attributed to the effect of temperature. Retail sales were decreased decidedly on Sundays, particularly in business sections. (15, 16).

BUTTER

It is estimated that 95 per cent of the factory butter made is retailed. (18). The following studies are related to home consumption only.

Effect of Income on Consumption.

Studies in New York, Philadelphia and in selected rural areas of New Jersey indicated that as income rises per capita consumption of butter rises, (1, 10, 12), though the New York study pointed out that butter sales appear to be fairly well maintained even under conditions of unusually low payrolls and expand rapidly as payrolls become unusually good. (1) The New York study also indicated that the demand for butter was less elastic among people of high income, demand in low income groups being quite elastic. (1).

Effect of Price.

Results of a New York project indicated that sales decrease as prices rise and that "when price reaches a point about 10 per cent above the average for the year, sales start to fall abruptly". (3).

Effect of Availability on Consumption.

Per capita consumption of butter on farms as indicated in a New Jersey study is materially higher when butter is made than when purchased. (12).

Effect of Quality on Consumption.

In a Washington study reasons given by housewives for purchasing given brands of butter in order of importance were: taste or quality, price, and uniformity and reliability. (7).

Effect of Temperature.

In a New York study it is pointed out that there appears to be some relation between monthly temperature and butter sales decreasing with increases in temperature. This was attributed however, to the seasonal movement of residents from particular city districts, as it was found that the variation was especially true in high income districts. (1).

Effect of Size and Composition of Family.

A New Jersey rural study indicated that per capita consumption of butter decreases as size of family increases and consumption appears to be less per capita in families with children. (12).

CHEESE

Effect of Income.

Philadelphia studies indicate that per capita consumption is related to income, though as higher incomes are attained the effect on consumption becomes less. (2 and 10).

Effect of Size of Family.

Results secured in a New Jersey rural survey indicated that there appears to be a decline in the consumption of cheese per capita as size of family increases. (12).

Effect of Competition.

Cottage cheese appears to compete with other types of cheese. In a rural study in New Jersey results indicated that families with cows used less store varieties of cheese, presumably because of the availability of milk for cheese-making purposes. It also appeared that more cottage cheese was sold on Friday, presumably to replace meat. (12).

ICE CREAM

Per capita consumption of ice cream appears to be related to income though after a given income level is attained further increases in income have less effect on consumption.

CONDENSED AND EVAPORATED MILK

It is estimated that approximately 80 per cent of the condensed and evaporated milk and buttermilk manufactured in the United States is retailed. (18)

Effect of Income.

A Philadelphia consumer study indicates that family consumption is inversely correlated with income. (2).

Effect of Competition

A Philadelphia study indicates that relative price is probably an important factor in determining consumption of condensed and evaporated milk, though convenience is listed as being of importance. (2).

Studies in Philadelphia, New York, and selected rural areas of New Jersey indicate that condensed and evaporated milk are used as substitutes for fluid milk and cream. (2,3,12,16).

New York studies indicate that evaporated milk is apparently used as substitute for cream in coffee and that seasonal variation in demand for evaporated milk is similar to that for coffee cream, being high in winter and low during hot weather. (3,16).

Day of the week fluctuation in demand is likewise similar for that of light cream. (16).

Possibilities of Expanding the Demand for Dairy Products

In considering the possibilities of expanding the demand for dairy products, it is of interest to note the present utilization of milk in the form of fluid milk and cream and the various manufactured products. This is shown in the following table:

Approximate Percentage of Total Milk Utilized in Various Products

Market milk and cream	47.8
Creamery butter manufacture	25.4
Farm usage including butter and waste	16.4
Factory cheese	3.5
Condensed & evaporated milk	3.4
Ice cream	3.4
Powdered milk1
Total	100.0 %

There is no doubt but that quality of dairy products is a factor which has an influence on consumption. Per capita consumption of products that are of satisfactory, dependable quality appear to be higher than for those products which do not possess these characteristics. The improvement in the quality

of city milk supplies has undoubtedly been most helpful in winning consumer confidence. Standardization of city milk supplies from the standpoint of butterfat content, bacteria, and other quality factors has also won consumer confidence for this product. The educational effort and advertising of milk by the dairy councils and milk distributing organizations have been important factors in increasing milk consumption. Similar effort to acquaint the consuming public with the characteristics of other dairy products would probably tend to expand the demand for them. New uses for dairy products in the preparation of various food articles and the merchandising of dairy products so that they would be more readily available for use in the household offer possibilities for expanding the demand for dairy products.

Research Needed to Provide a Basis for Broadening the Demand for Dairy Products

It is evident from studies which have been made that the demand situation is complex. If efforts to increase demand and improve distribution are to be successful such efforts must be based on a thorough understanding of the factors affecting demand and the quantitative effect of each.

Further research therefore, is necessary to determine more exactly the factors affecting the demand for various dairy products and to secure more exact quantitative measures of these influences. While basic data necessary for a comprehensive analysis of domestic or world prices are perhaps not available, an attack on the problem can be made through an expansion of studies of prices in particular areas. Such studies as have been made as to the demand for specific dairy products in given areas have yielded valuable results. In many instances, however, the periods covered in these studies and the areas selected have not exhibited wide variation in such factors as price, consumption, and employment or income. Consequently the result of such studies have serious limitations. The most feasible means of removing these limitations is probably through the extension of similar studies into other areas with different characteristics, and a continuation of studies in particular areas.

In this connection two current projects of the Bureau of Agricultural Economics are of interest. First is a study of milk consumption in metropolitan Boston, in cooperation with the New England Dairy and Food Council, the Massachusetts Agricultural College, the Massachusetts State Department of Agriculture, the University of New Hampshire, and the New England Research Council on Marketing the Food Supply. The purpose of this study is to determine milk consumption and the factors influencing consumption, similar to surveys previously made in Philadelphia. (2 and 10). With the benefit of previous surveys, attention is directed towards securing information on particular factors previously indicated as of importance. Also, data were secured from distributors as to daily sales over a two year period somewhat similar to the procedure followed in the New York, Chicago and Detroit studies. In addition, however, an attempt is being made to make this study of daily sales continuous. A second current study is of dairy products consumption and factors affecting consumption in Baltimore. This study is similar to those made in Philadelphia.

A field in which practically no research work has been undertaken is a determination and measurement of the factors influencing the usage of dairy products in the manufacture of other products such as baking and confectionery products.

While in total the volume of milk utilized indirectly in this manner for human consumption is relatively small compared to the volume going into direct consumption through such products as fluid milk and cream, butter, cheese and condensed and evaporated milk, this volume is significant and determination of factors affecting the demand for dairy products in the manufacture of other products would undoubtedly be of some value both in explaining demand for all dairy products and likewise in indicating probable trends.

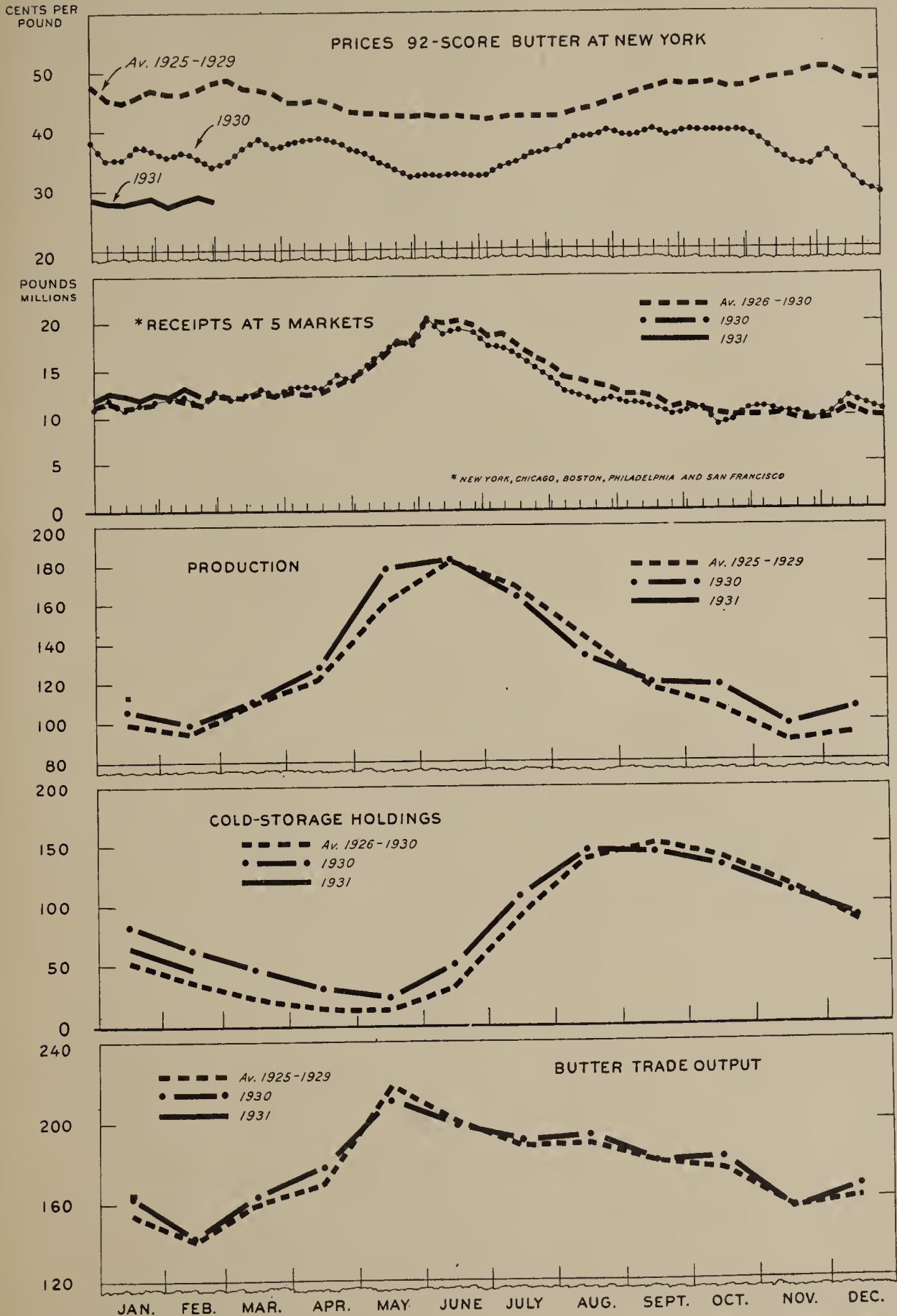
LIST OF REFERENCES ON DEMAND FOR DAIRY PRODUCTS

1. W. C. Waite - A study of demand for butter in selected chain stores of New York City. Unpublished - United States Department of Agriculture, Bureau of Agricultural Economics.
2. Lawrence A. Adams and George O. Smith - Consumer Demand for Milk in Philadelphia. U.S.D.A., B.A.E. in cooperation with Pennsylvania Department of Agriculture, Bureau of Markets. Preliminary Report, mimeographed October, 1924.
3. R. E. Van Cise, William H. Marcussen, and H. A. Ross - Supply and Potential Demand for Milk in New York City. U.S.D.A., B.A.E., and New York Food Marketing Research Council. Mimeographed May, 1926.
4. F. A. Buechel - Report of a Survey of Daily Per Capita Consumption of Milk and Cream in Families with Children in the Fourth and Fifth Grades of the Elementary Schools in Austin, Texas. University of Texas, Bureau of Business Research.
5. F. A. Buechel - Report of a Survey of the Per Capita Consumption of Fluid Milk and Cream in Families with Children in the Junior High Schools and Upper Grade Schools in Washington, D. C. U.S.D.A., B.A.E., Mimeographed, June, 1929.
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7. Lawrence A. Adams - Use of Brands in Selling Butter in Washington, D.C. U.S.D.A., B.A.E., Mimeographed, Preliminary.
8. L. C. Bulmer - Survey of the Birmingham Butter Market. Jefferson County Board of Health, Birmingham, Alabama. October 31, 1928.
9. C. F. Doane - The Milk Supply of 29 Southern Cities, U.S.D.A., B.A.I., Bulletin 70, year 1905.
10. F. F. Lininger and Hutzler Metzger - The consumption of Dairy Products of 1370 Families in Philadelphia. Pennsylvania State College, School of Agriculture, and Experiment Station. Bulletin 245, March, 1930. In cooperation with U.S.D.A., B.A.E.
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12. W. C. Waite and C. B. Howe. - The Consumption of Dairy Products in Six New Jersey Townships. New Jersey Agricultural Experiment Station, Bulletin 506, June, 1930. In cooperation with U.S.D.A., B.A.E.

13. Horner, J. T. - The Detroit Milk Market. Michigan Agricultural Experiment Station, Special Bulletin 170, March, 1928.
14. C. A. Scholl and W. O. Hedrick - The Lansing Food Survey. Michigan Agricultural Experiment Station. Technical Bulletin 107, November, 1930.
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16. H. A. Ross - Some Factors Affecting the Demand for Milk and Cream in the Metropolitan Area of New York. U.S.D.A. Technical Bulletin 73, June, 1928.
17. C. A. Brown - Costs and Margins and Other Related Factors in the Distribution of Fluid Milk in Four Illinois Market Areas. Illinois Agricultural Experiment Station Bulletin 318, December, 1928.
18. Food Industries - Market Research Department, Photostatic Data.
19. Norton, L. J. & Spencer, Leland - A Preliminary Survey of Milk Marketing in New York. Cornell Agricultural Experiment Station Bulletin 445, November, 1925.

THE BUTTER SITUATION

PRICES, RECEIPTS, PRODUCTION, STORAGE STOCKS, AND TRADE OUTPUT



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DAIRY PRODUCTS

OUTLOOK CHARTS

WITH
EXPLANATIONS

WASHINGTON, D. C.

JANUARY, 1931

List of Dairy Products Outlook Charts

Production

	Negative
Dairy cows and heifers, Number Jan. 1, 1925.	17227
Milk produced on farms, 1924	19558
Farms reporting cows milked, percentage of all farms, Jan. 1, 1925	18937
Milk production and utilization on farms, 1929.	21731
Dairy and poultry products sold by farmers, money income, 1928.	20345
Cattle and Milk cows on farms, Jan. 1, compared with production of beef and veal, and of milk, 1900 - 1930.	18209
Creamery butter production, 1929.	21881
Condensed and evaporated milk production, 1929.	21922
Cheese production, 1928.	20268
Milk production per cow in herd on first day of each month, 1928-1930.	14530
Yearly production of creamery butter by regions, 1918-1929.	18560
Production of farm and factory cheese and butter, United States, 1849-1929.	11555

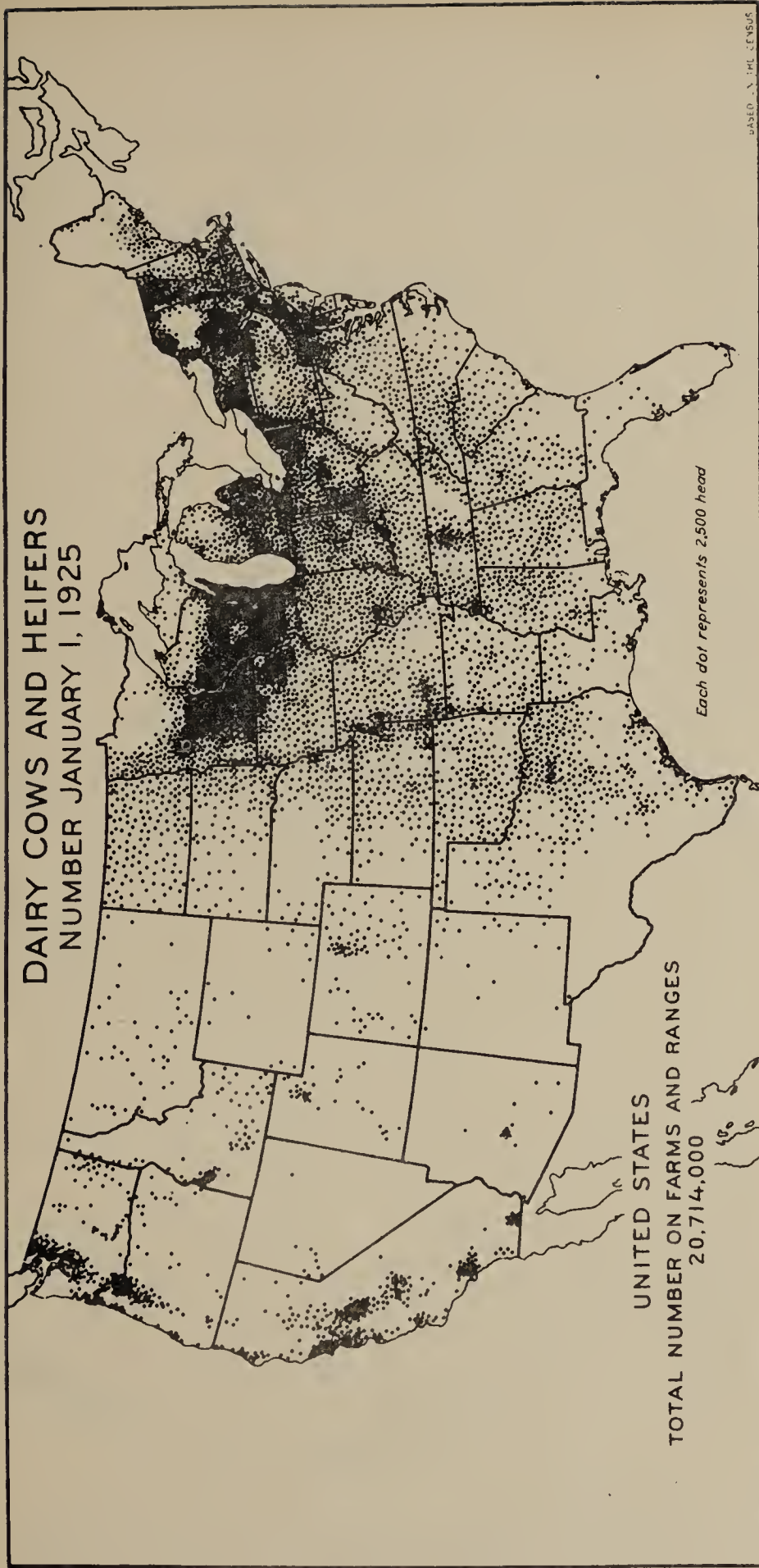
Marketing

Butter: Receipts at four markets by States of origin per cent of total, 1928.	21518
Per capita consumption of dairy products in the United States, 1917-1929.	13721
Creamery butter: Cold storage holdings, net movement into and out of storage and New York price, 1925-1930.	18565
Excess of exports or imports of dairy products, United States, 1851-1930.	11554

Prices

	Negative
Prices to producers of butterfat in selected States and the United States, monthly 1925-1930.	20679
Spread between cost of feed and price of butter, 1917 to date	10910
Prices of butter at New York, 1890-1930.	20137
Butter-92 score-price per pound at New York, by weeks, 1927-1930.	20958
Monthly average prices of butter in Great Britain and New York and total monthly imports and exports of butter into United States, 1921, to date.	14567
United States price of dairy cattle and price of steers at Chicago, 1878-1930.	18764
Price of butter and consumption per capita of oleomargerine. 18885 1890-1929.	

DAIRY COWS AND HEIFERS NUMBER JANUARY 1, 1925



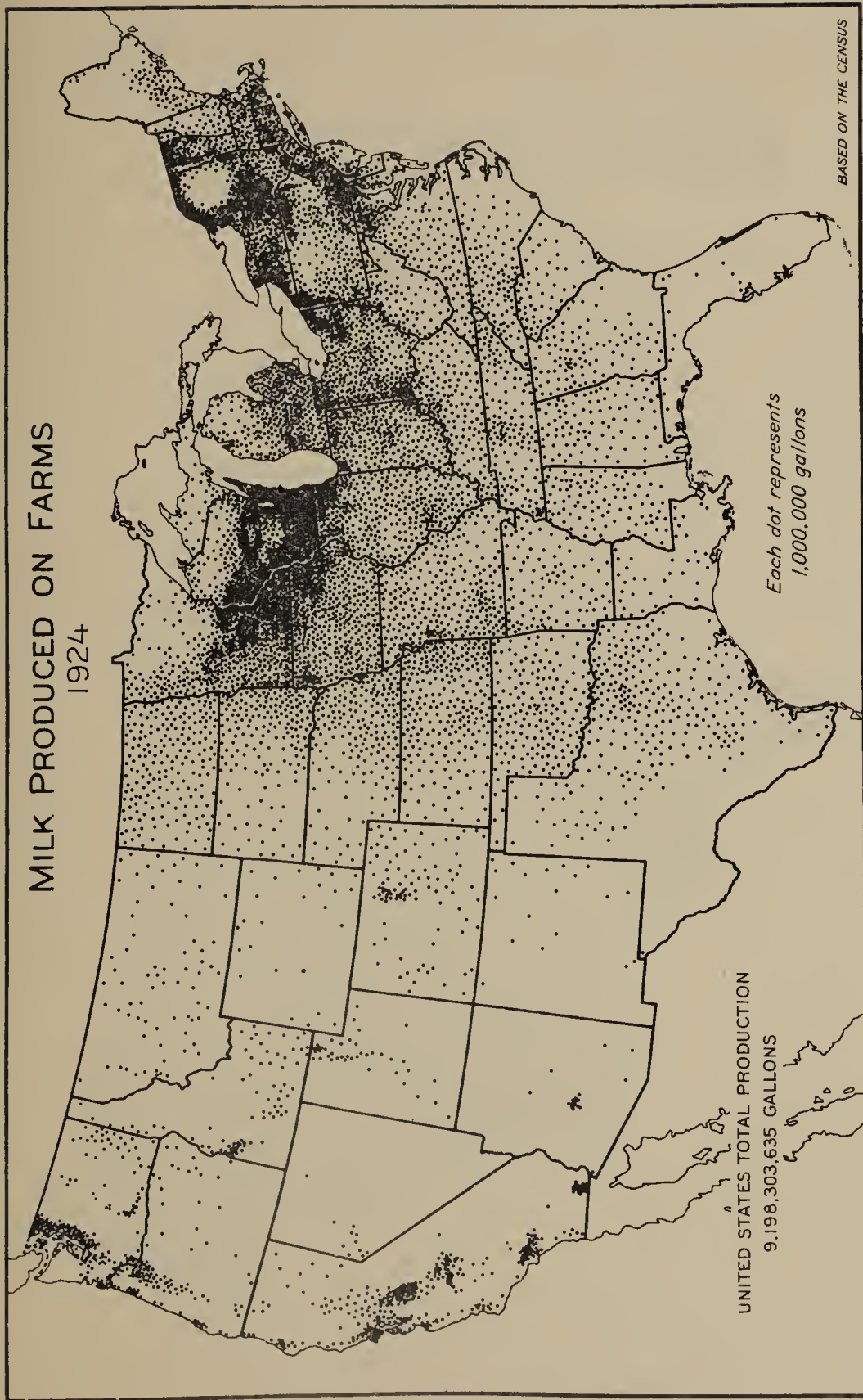
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NEG. 17227

THIS MAP SHOWS THE GENERAL DISTRIBUTION OF DAIRY COWS ON FARMS IN THE UNITED STATES. DAIRY CATTLE ARE FOUND IN EVERY STATE, BUT GREAT CONCENTRATION OCCURS IN WISCONSIN, NEW YORK, MICHIGAN, OHIO, MINNESOTA, AND PENNSYLVANIA. IN THE COUNTRY OUTSIDE THE LARGE SURPLUS MILK-PRODUCING AREA, THE DISTRIBUTION OF DAIRY COWS USUALLY CORRESPONDS WITH DISTRIBUTION OF POPULATION. MANY DAIRY CATTLE ARE FOUND ON THE PACIFIC COAST, BUT IN THE MOUNTAIN STATES THEY ARE FOUND ONLY NEAR THE POPULATION CENTERS OR IN IRRIGATED VALLEYS WHERE FEED CAN BE GROWN

MILK PRODUCED ON FARMS 1924



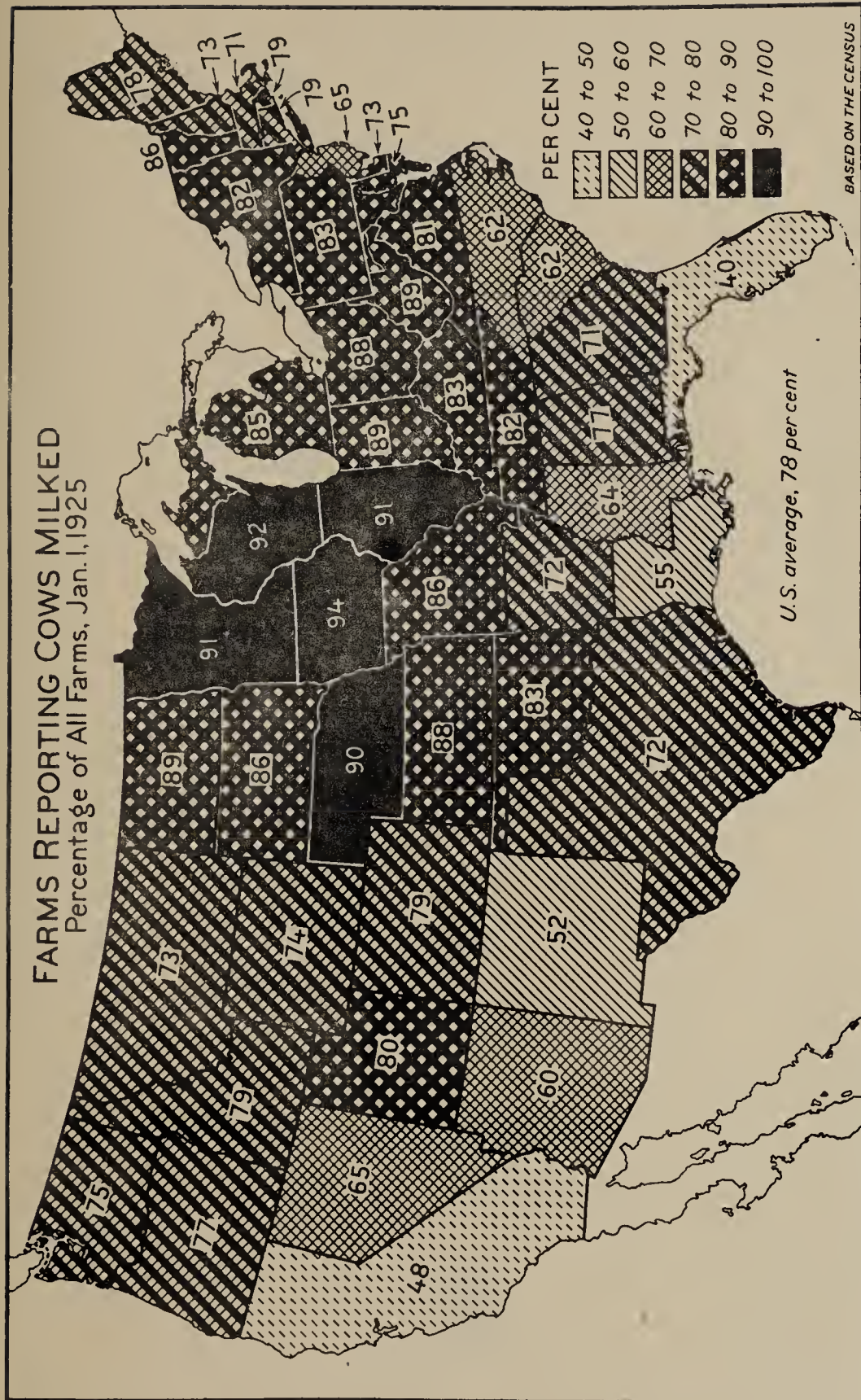
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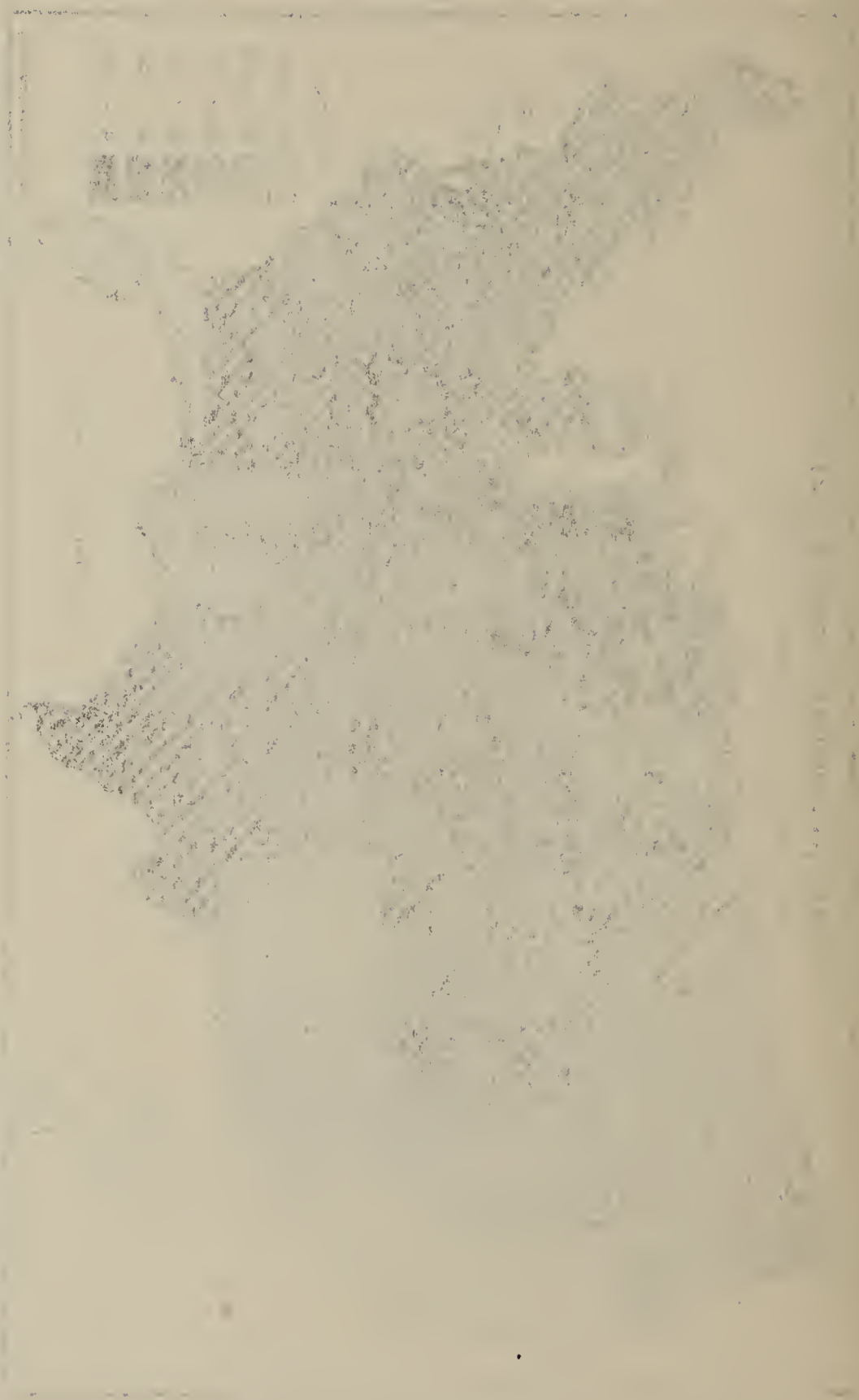
NEG. 19558

GREATEST MILK PRODUCTION OCCURS IN STATES THAT HAVE THE LARGEST NUMBER OF MILK COWS, BUT MILK PRODUCTION PER COW VARIES WIDELY IN DIFFERENT PARTS OF THE COUNTRY. AS A RULE, PRODUCTION PER COW IS HIGHEST IN THE MORE SPECIALIZED PRODUCING SECTIONS OF THE NORTHEAST AND ON THE PACIFIC COAST, BUT IS LOWEST IN THE SOUTHERN STATES. IN MANY PARTS OF THE COUNTRY, WHERE MILK PRODUCTION IS NOT A LEADING FARM ENTERPRISE, PUREBRED DAIRY CATTLE ARE NOT THE RULE, AND MILK PRODUCTION MAY EXTEND ONLY THROUGH A PERIOD OF A FEW MONTHS OF GOOD PASTURE. THE 1924 CENSUS FIGURES INDICATE THAT IN THE CORN BELT NEARLY 40 PER CENT OF THE COWS MILKED WERE KEPT "MAINLY FOR BEEF PURPOSES"

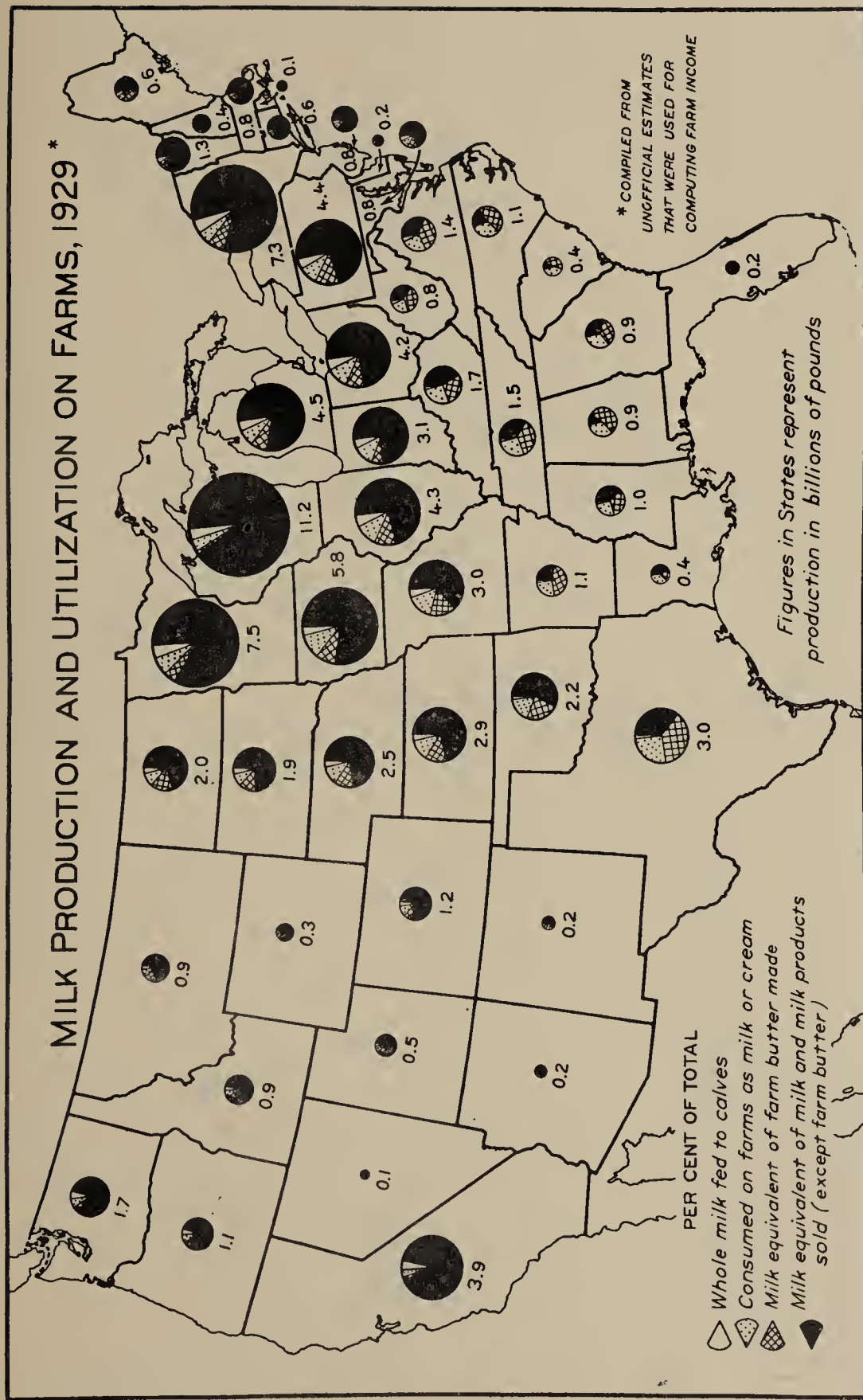
FARMS REPORTING COWS MILKED Percentage of All Farms, Jan. 1, 1925



THE GREATEST PERCENTAGE OF FARMS REPORTING COWS MILKED OCCURRED IN IOWA, WISCONSIN, ILLINOIS, MINNESOTA, AND NEBRASKA. ALL OF THESE REPORTED OVER 90 PER CENT. IN MOST NORTHEASTERN STATES MORE THAN 80 PER CENT OF THE FARMS REPORTED COWS MILKED ON JANUARY 1, 1925. THE SOUTHERN STATES AND CALIFORNIA REPORTED THE SMALLEST PERCENTAGE OF FARMS HAVING COWS MILKED. THE TYPE OF FARMING FOLLOWED IN VARIOUS REGIONS HAS A DISTINCT BEARING UPON THE PREVALENCE OF MILK COWS ON FARMS. IN THE CORN BELT, WITH MUCH ROUGHAGE AND GRAINS AVAILABLE, COWS ARE ALMOST UNIVERSALLY KEPT



MILK PRODUCTION AND UTILIZATION ON FARMS, 1929 *



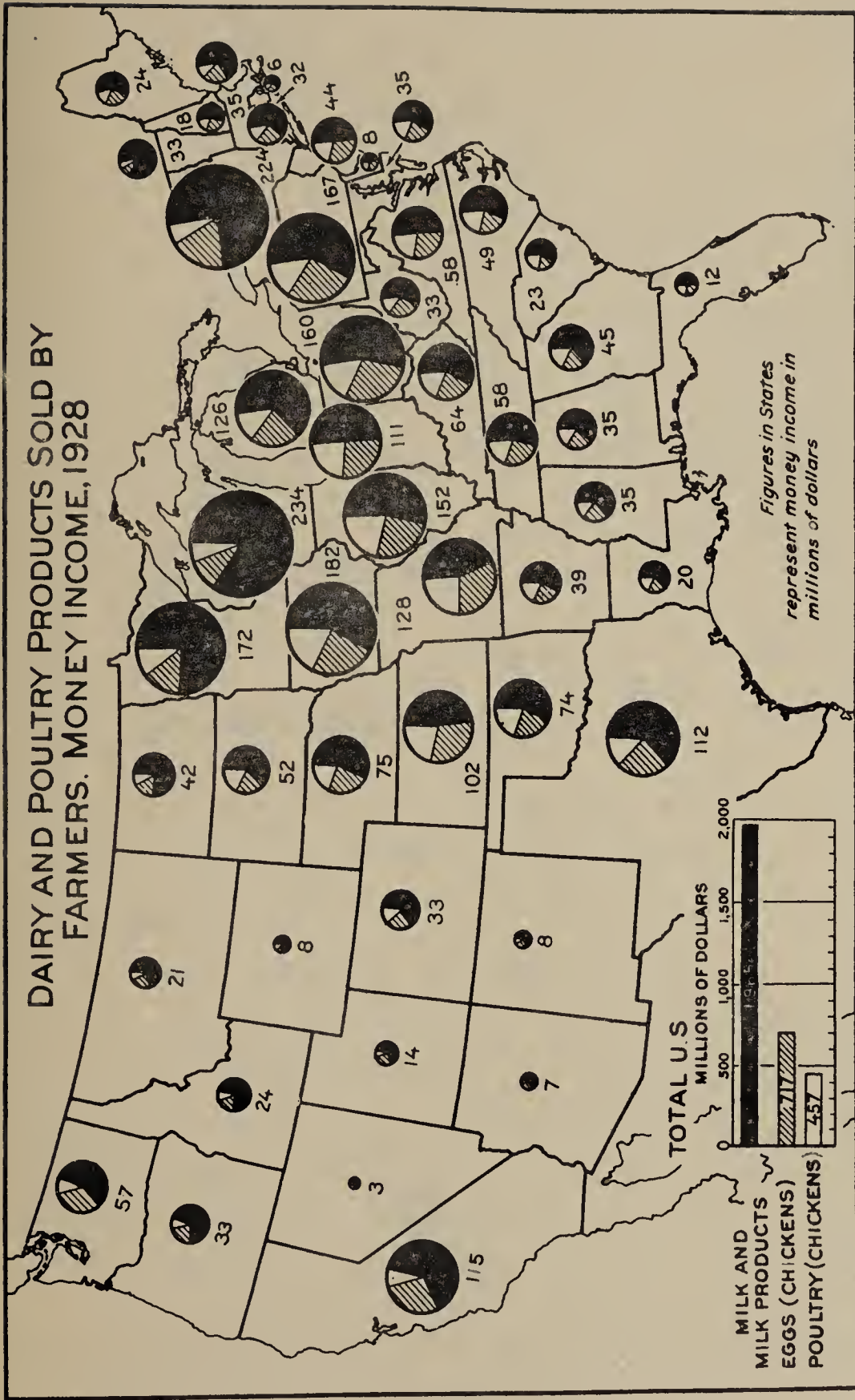
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NEG. 21731

THE STATE OF WISCONSIN PRODUCED THE GREATEST QUANTITY OF WHOLE MILK DURING THE YEAR OF 1929, WITH MINNESOTA AND NEW YORK NEXT IN IMPORTANCE. IN NEARLY ALL EXCEPT SOUTHERN STATES OVER 75 PER CENT OF THE TOTAL MILK PRODUCTION IS SOLD FROM THE FARM IN THE FORM OF WHOLE MILK OR MILK PRODUCTS. IN MOST SOUTHERN STATES THE GREATER PERCENTAGE OF THE MILK PRODUCED IS EITHER CONSUMED ON THE FARM AS MILK OR CREAM OR IS MADE INTO BUTTER ON THE FARM; THE SALES OF MILK ARE OF SECONDARY IMPORTANCE AS COMPARED WITH NORTHERN STATES. (DATA FROM DIVISION OF CROP AND LIVESTOCK ESTIMATES)

DAIRY AND POULTRY PRODUCTS SOLD BY FARMERS. MONEY INCOME, 1928



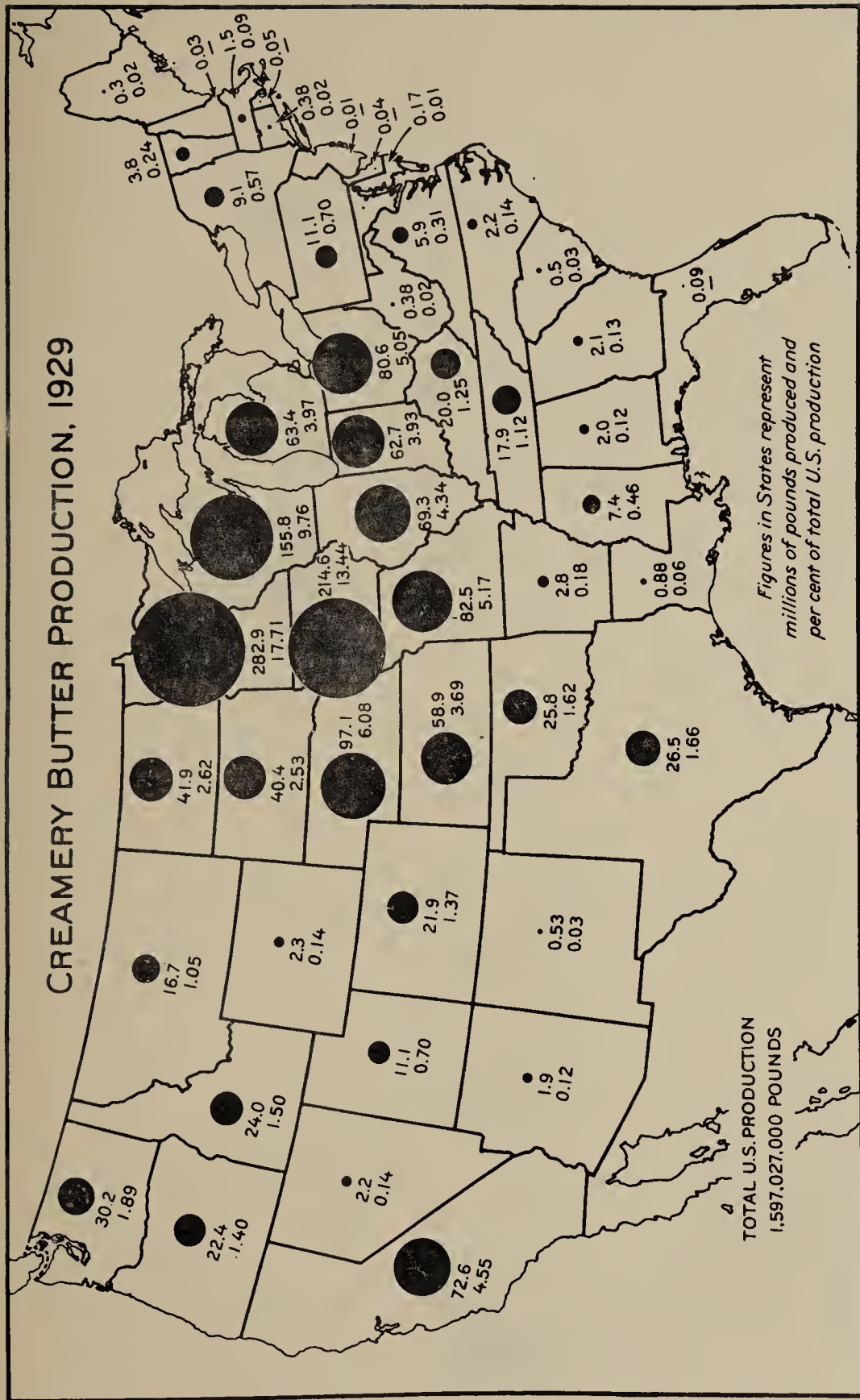
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NEG. 20345

MONEY INCOME TO FARMERS FROM THE SALE OF MILK AND MILK PRODUCTS DURING 1928 WAS ESTIMATED TO HAVE BEEN \$1,965,000,000 - THE GREATEST INCOME FROM ANY ONE FARM ENTERPRISE IN THE UNITED STATES. THE SALE OF MILK AND MILK PRODUCTS WAS AN IMPORTANT SOURCE OF INCOME IN EVERY STATE, WITH WISCONSIN AND NEW YORK LEADING IN VOLUME OF SALES. INCOME FROM THE SALE OF MILK AND MILK PRODUCTS WAS OVER 60 PER CENT GREATER THAN THE TOTAL INCOME FROM PORK AND PORK PRODUCTS, WHILE THE INCOME FROM THE SALE OF CHICKENS AND EGGS WAS GREATER THAN THE INCOMES FROM EITHER HOGS AND PORK OR CATTLE, CALVES, BEEF, AND VEAL. (DATA FROM DIVISION OF CROP AND LIVESTOCK ESTIMATES)

CREAMERY BUTTER PRODUCTION, 1929



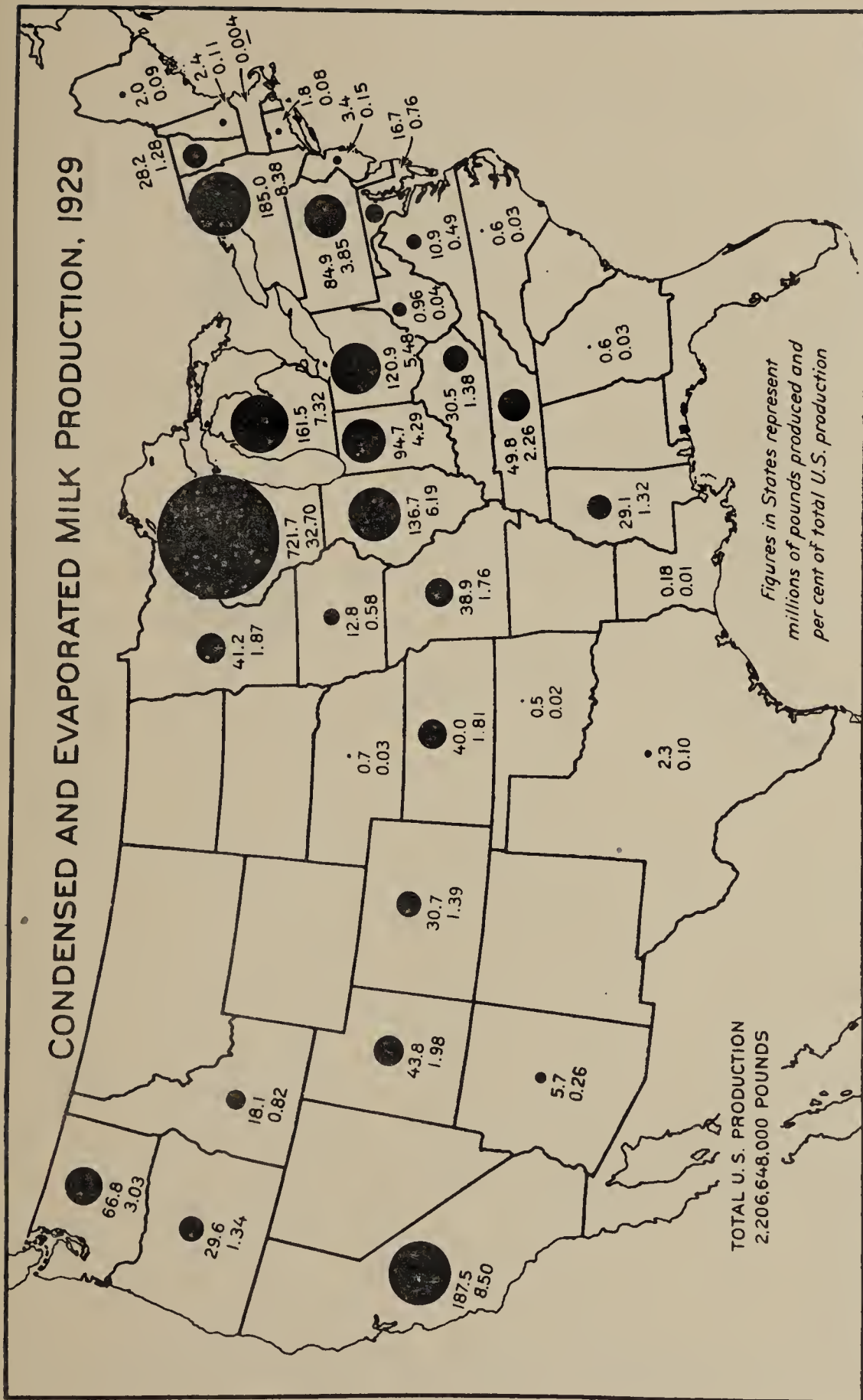
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NEG. 21881

MINNESOTA IS THE GREATEST CREAMERY-BUTTER PRODUCING STATE WITH IOWA AND WISCONSIN NEXT IN IMPORTANCE. IN 1929 THESE THREE STATES PRODUCED OVER 40 PER CENT OF ALL CREAMERY BUTTER IN THE UNITED STATES. ALL STATES IN THE SOUTHERN PART OF THE COUNTRY ARE RELATIVELY UNIMPORTANT IN BUTTER PRODUCTION. NEW YORK STATE, ONE OF THE IMPORTANT DAIRY STATES, PRODUCED A RELATIVELY SMALL QUANTITY OF BUTTER, THE MILK BEING USED MAINLY AS WHOLE MILK OR CREAM IN ADJACENT LARGE POPULATION CENTERS, AND FOR CONDENSED MILK. (DATA FROM "CROPS AND MARKETS")

CONDENSED AND EVAPORATED MILK PRODUCTION, 1929

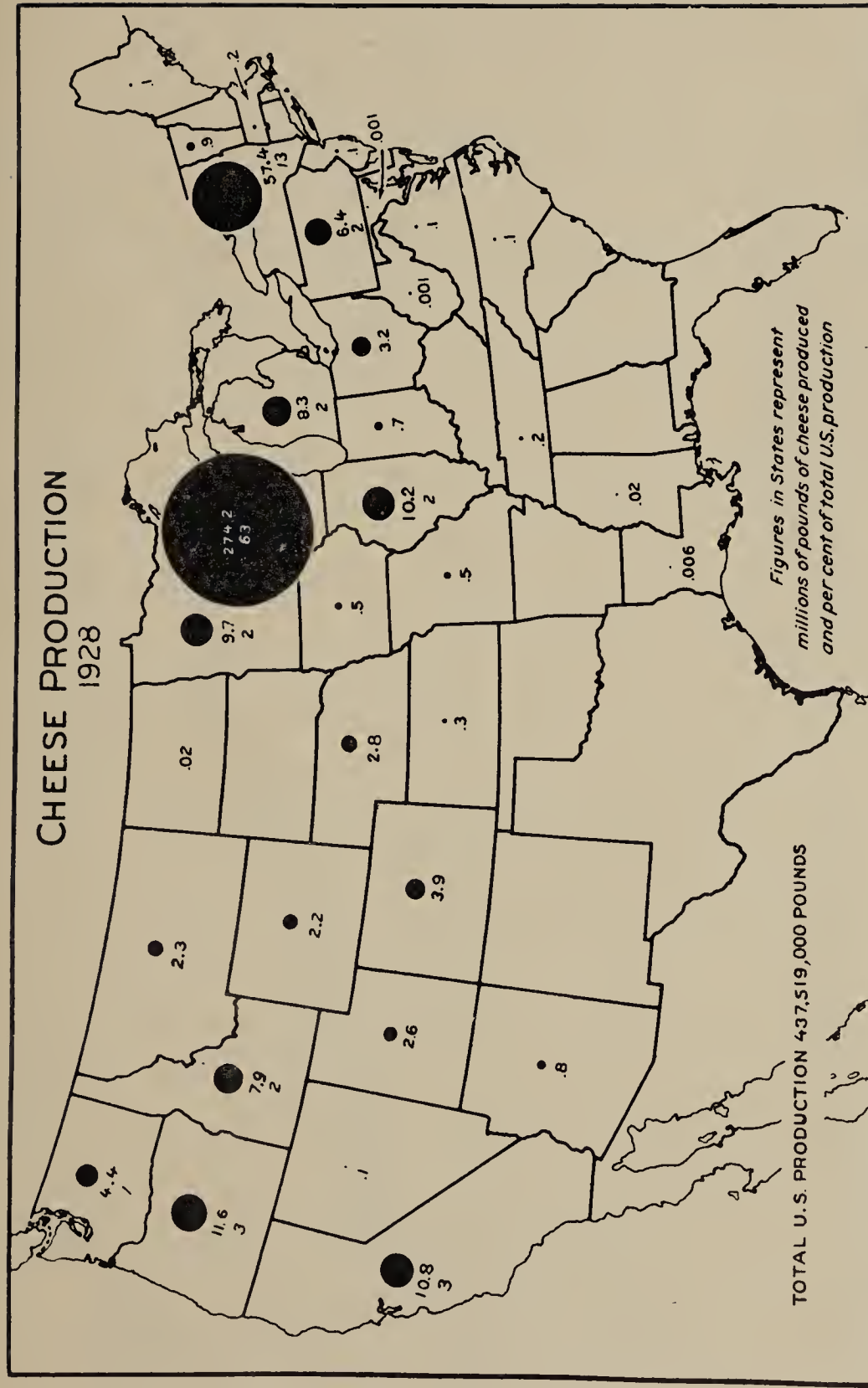


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NEG. 21922

THE STATE OF WISCONSIN PRODUCED ABOUT 33 PER CENT OF THE TOTAL PRODUCTION OF CONDENSED AND EVAPORATED MILK IN 1929, WITH NEW YORK, CALIFORNIA, MICHIGAN, AND ILLINOIS NEXT IN IMPORTANCE. SOME STATES PRODUCED NO CONDENSED OR EVAPORATED MILK, AND THE PRODUCTION IN THE SOUTHERN STATES WAS SMALL. MINNESOTA AND IOWA, THE TWO LARGEST CREAMERY-BUTTER PRODUCING STATES, PRODUCED ONLY SMALL QUANTITIES OF CONDENSED AND EVAPORATED MILK. (DATA FROM DIVISION OF DAIRY AND POULTRY PRODUCTS)

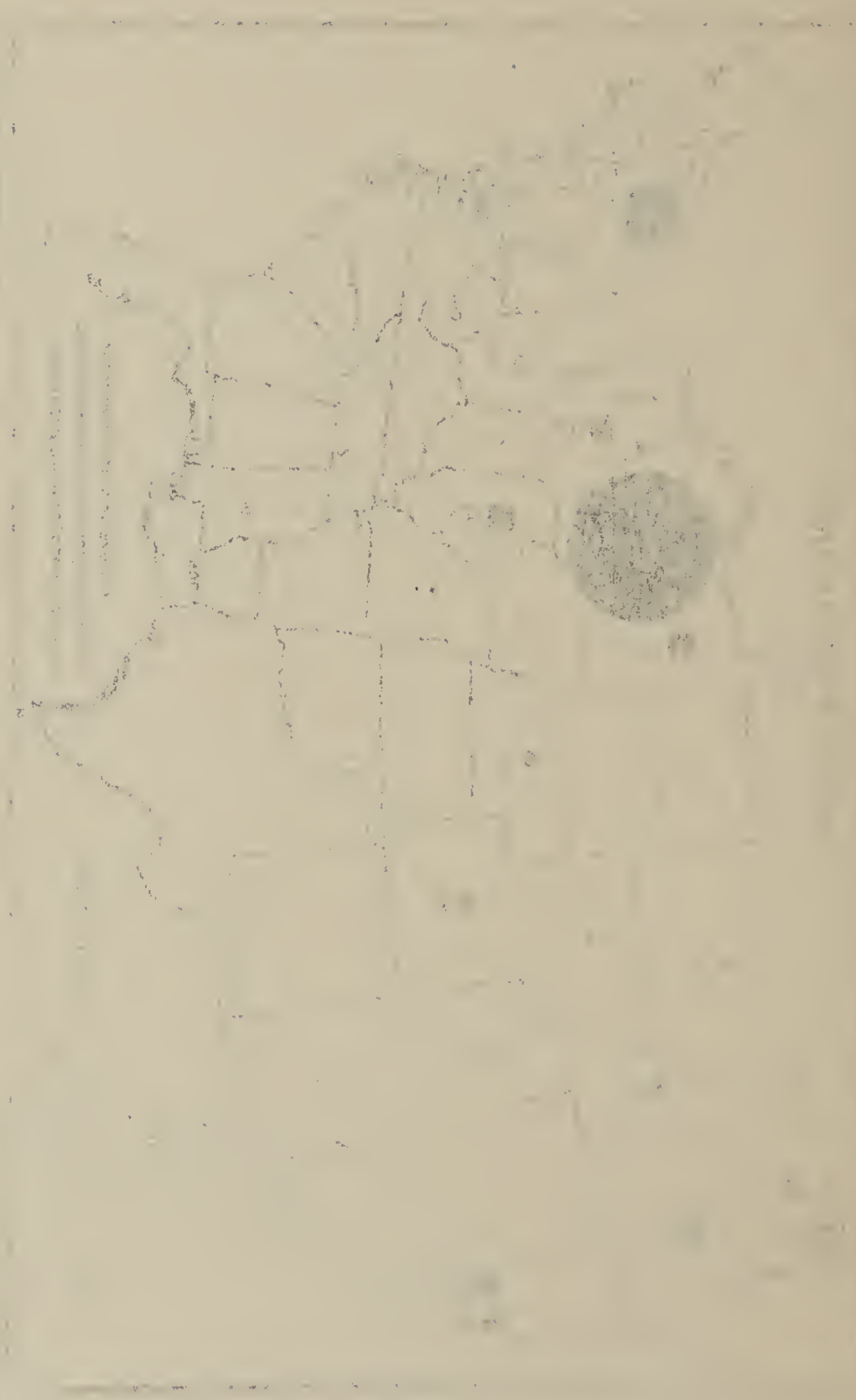


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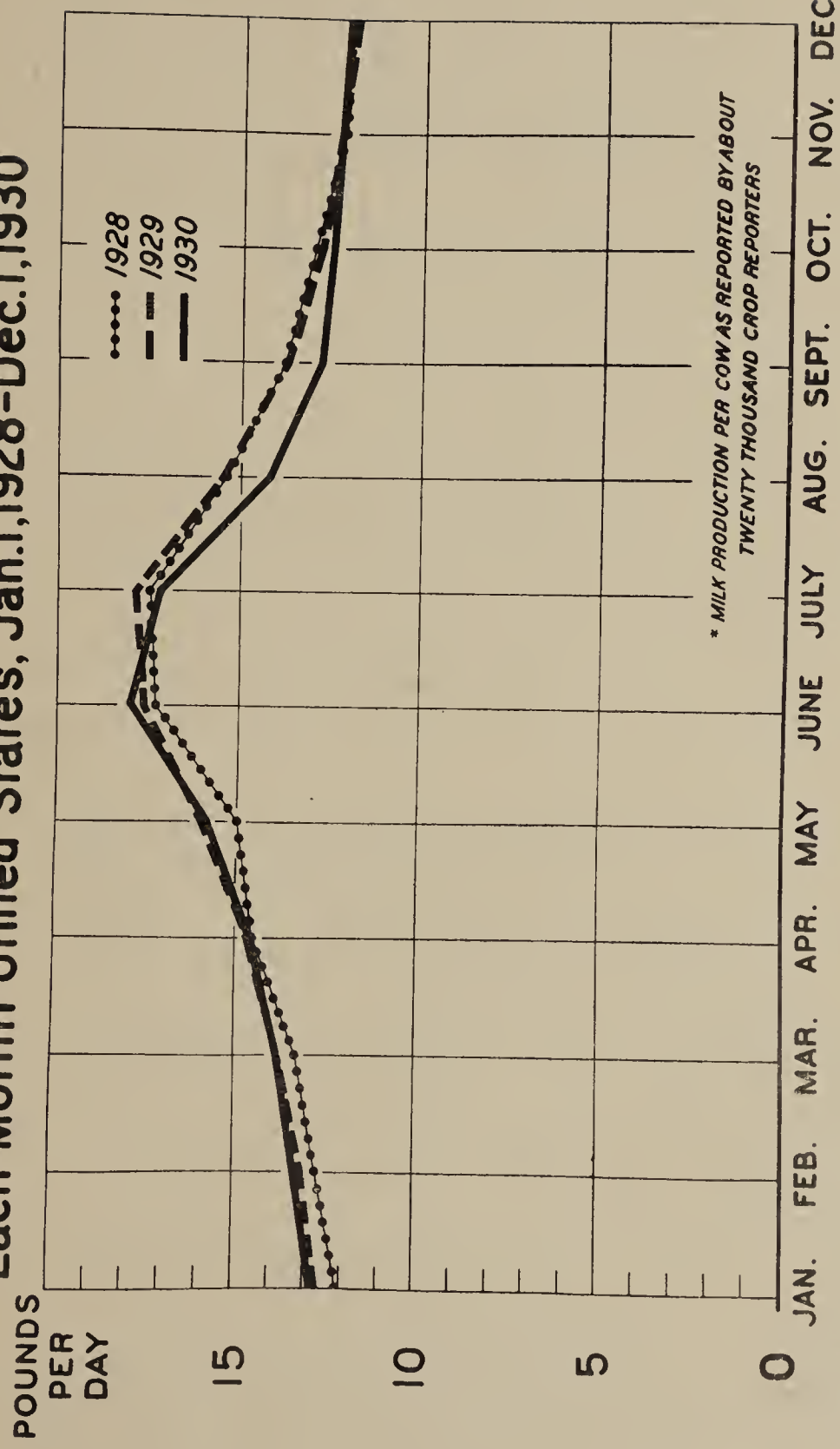
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NEG. 20268

THE STATE OF WISCONSIN PRODUCED 63 PER CENT OF ALL CHEESE IN THE UNITED STATES IN 1928; NEW YORK PRODUCED 13 PER CENT; ALL OTHER STATES COMBINED PRODUCED ONLY 24 PER CENT. MINNESOTA AND IOWA, THE GREATEST BUTTER-PRODUCING STATES, PRODUCE ONLY SMALL QUANTITIES OF CHEESE, AND OTHER STATES IN THE MIDDLE WEST ARE ALSO OF SMALL IMPORTANCE IN CHEESE PRODUCTION. PRACTICALLY NO CHEESE IS PRODUCED IN THE SOUTHERN STATES. IN CHEESE PRODUCTION THE STATES, OF OREGON, CALIFORNIA, AND IDAHO ARE AS IMPORTANT AS ARE THE STATES IN THE MIDDLE WEST EXCEPT WISCONSIN. LESS THAN 5 PER CENT OF THE TOTAL WHOLE MILK PRODUCTION OF THE UNITED STATES IS USED IN CHEESE PRODUCTION. (DATA FROM "CROPS AND MARKETS")



*Milk Production Per Cow in Herd on First Day of Each Month United States, Jan.1,1928-Dec.1,1930

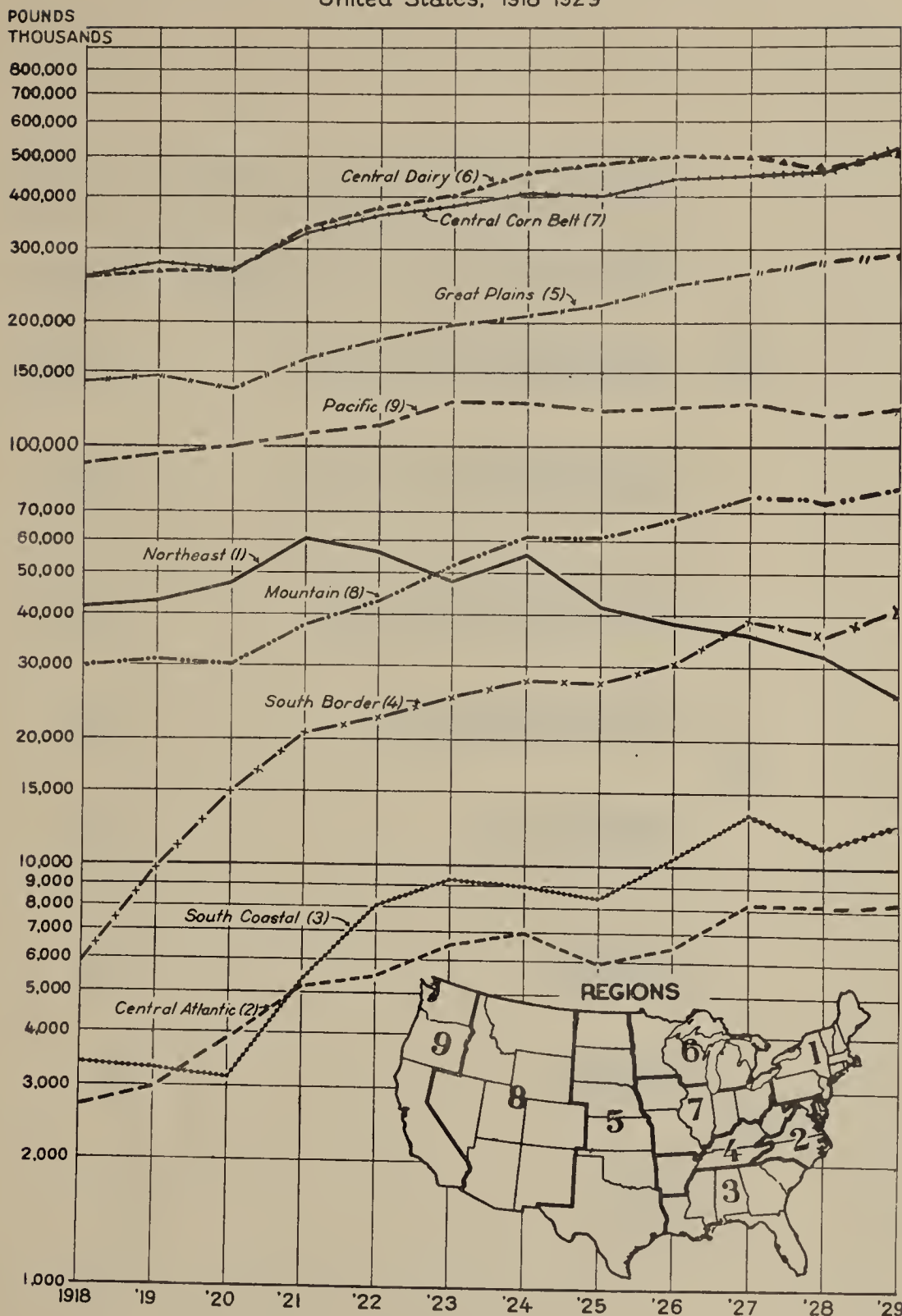


U S DEPARTMENT OF AGRICULTURE

NEG. 14530B, BUREAU OF AGRICULTURAL ECONOMICS

PRODUCTION OF MILK IS NOT UNIFORM THROUGHOUT THE YEAR, BUT FLUCTUATES ACCORDING TO WEATHER, PASTURE CONDITIONS, AND FRESHENING PERIODS. LOWEST MONTHLY PRODUCTION USUALLY COMES IN NOVEMBER, DECEMBER, AND JANUARY, AND THE HIGHEST USUALLY IN JUNE AND JULY. AVERAGE PRODUCTION IN JUNE AND JULY IS USUALLY ABOUT 40 PER CENT GREATER THAN PRODUCTION IN THE LOWEST WINTER MONTHS. PRODUCTION PER COW IN JULY, AUGUST, SEPTEMBER, AND OCTOBER OF 1930 WAS BELOW NORMAL BECAUSE OF DROUTH CONDITIONS. (DATA FROM DIVISION OF CROP AND LIVESTOCK ESTIMATES)

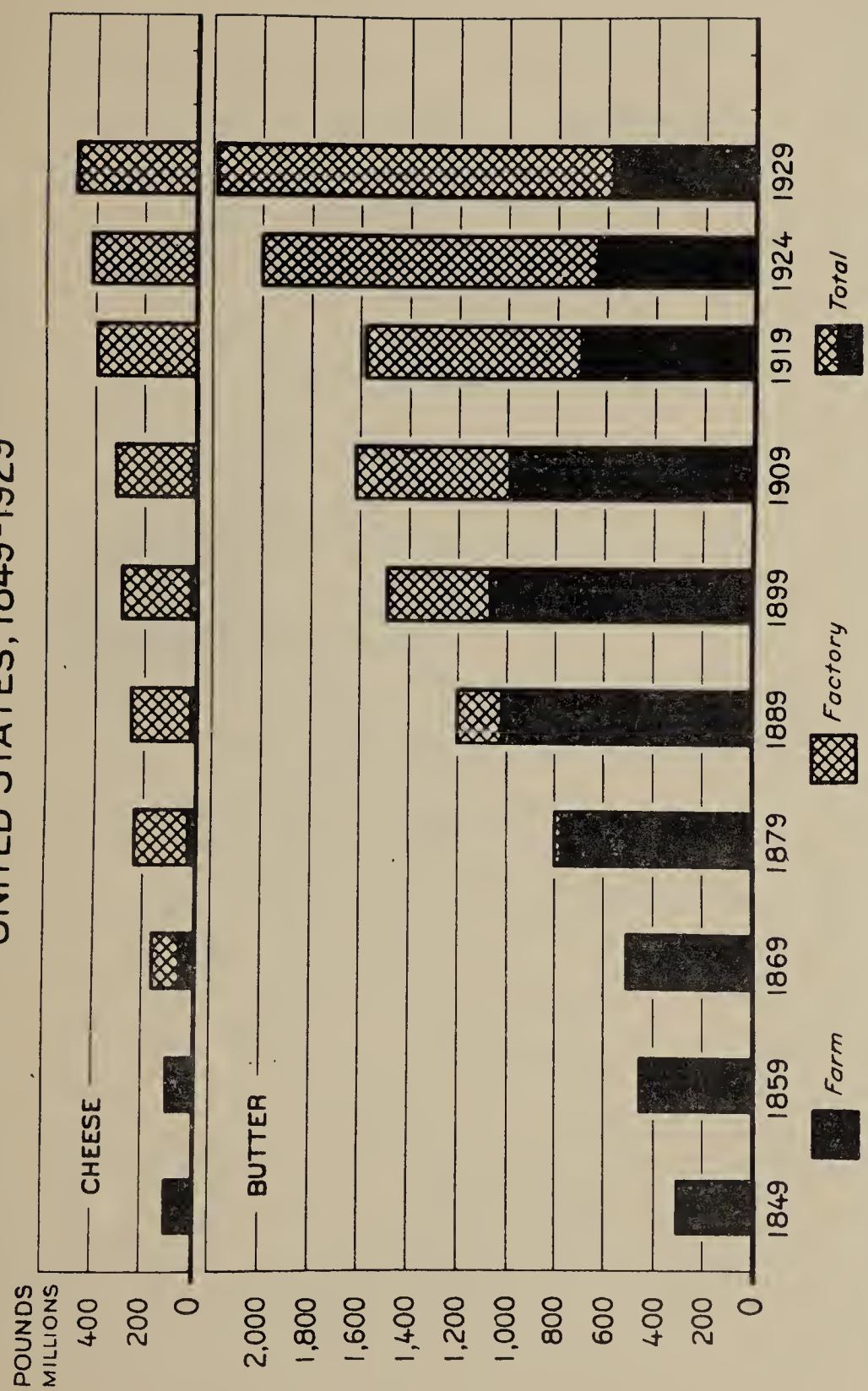
YEARLY PRODUCTION OF CREAMERY BUTTER BY REGIONS United States, 1918-1929



NEG. 18560

THE TREND IN BUTTER PRODUCTION IN ALL REGIONS OF THE UNITED STATES WAS UPWARD DURING THE YEARS 1918 TO 1929 WITH THE EXCEPTION OF THE NORTHEASTERN REGION WHERE THE TREND HAS BEEN DOWNWARD SINCE 1921. SINCE 1918 THE GREATEST PERCENTAGE INCREASES IN CREAMERY BUTTER PRODUCTION HAVE OCCURRED IN THE SOUTHERN STATES, ALTHOUGH AS YET THEIR TOTAL PRODUCTION IS RELATIVELY SMALL. (DATA FROM "CROPS AND MARKETS")

PRODUCTION OF FARM AND FACTORY CHEESE AND BUTTER UNITED STATES, 1849-1929



U.S. DEPARTMENT OF AGRICULTURE

NEG. 11555 BUREAU OF AGRICULTURAL ECONOMICS

THE TOTAL PRODUCTION OF FARM AND FACTORY BUTTER IN THE UNITED STATES IN 1929 WAS ABOUT 2,200,000,000 POUNDS, OF WHICH ABOUT 1,600,000,000 POUNDS WAS MADE IN BUTTER FACTORIES, AND 600,000,000 POUNDS MADE ON FARMS. IN 1899 ABOUT TWO-THIRDS OF ALL BUTTER WAS MADE ON FARMS, BUT SINCE THAT TIME FARM BUTTER MAKING HAS DECLINED, AND FACTORY BUTTER MAKING HAS INCREASED GREATLY. SINCE 1869 ONLY A SMALL PERCENTAGE OF THE TOTAL CHEESE PRODUCTION HAS BEEN MADE ON FARMS, AND IN 1929 THE QUANTITY WAS NEGLIGIBLE. (DATA FROM DIVISION OF DAIRY AND POULTRY PRODUCTS)

THE UNIVERSITY OF CHICAGO

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PHYSICS 350

LECTURE 1

1.1. THE CLASSICAL LIMIT

1.2. THE QUANTUM LIMIT

1.3. THE CORRESPONDENCE PRINCIPLE

1.4. THE CLASSICAL LIMIT

1.5. THE QUANTUM LIMIT

1.6. THE CORRESPONDENCE PRINCIPLE

1.7. THE CLASSICAL LIMIT

1.8. THE QUANTUM LIMIT

1.9. THE CORRESPONDENCE PRINCIPLE

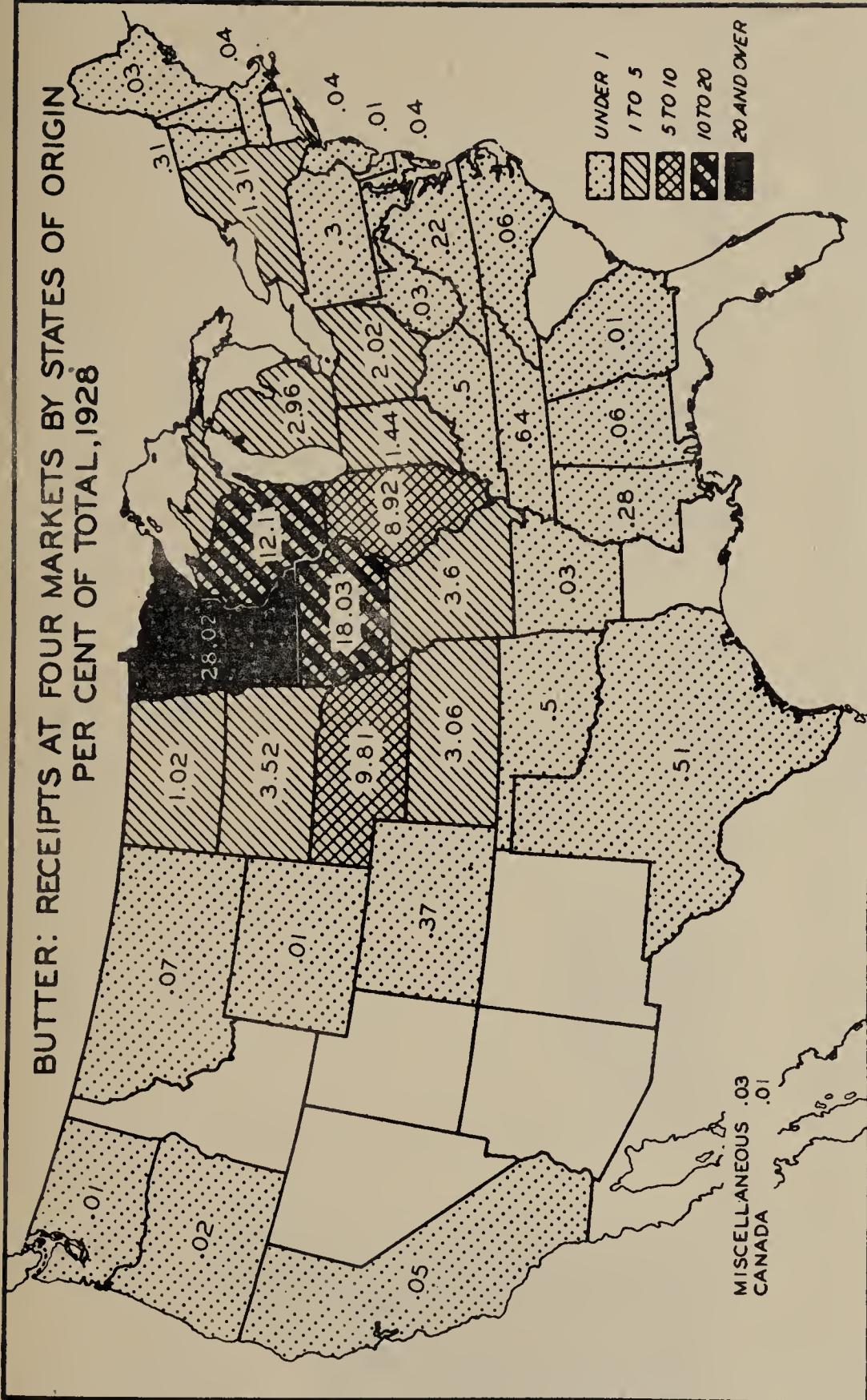
**BUTTER: RECEIPTS AT FOUR MARKETS BY STATES OF ORIGIN
PER CENT OF TOTAL, 1928**

Legend:

- UNDER 1
- 1 TO 5
- 5 TO 10
- 10 TO 20
- 20 AND OVER

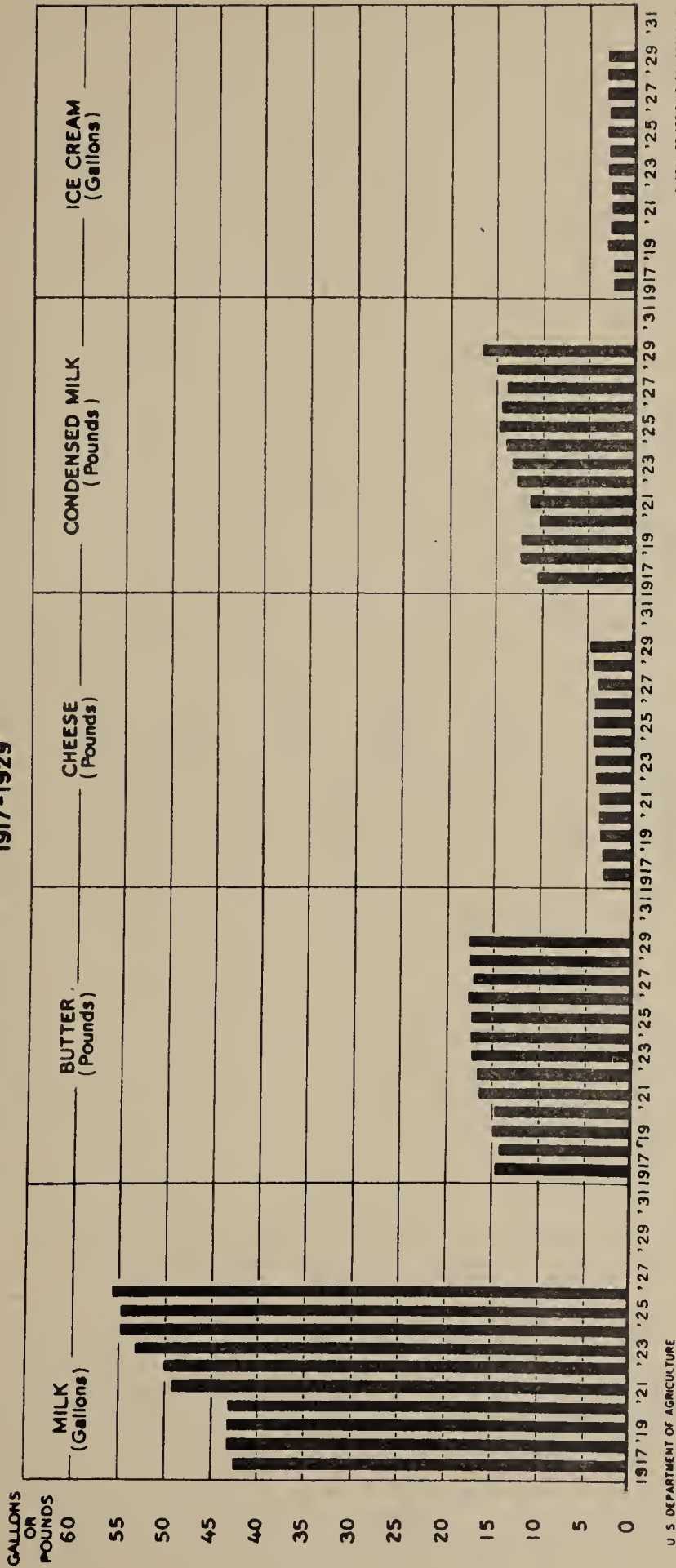
Map Data (State/Region): Percentage

State/Region	Percentage
Alaska	.03
Arctic	.04
British Columbia	.04
Alberta	.01
Saskatchewan	.04
Manitoba	.03
Ontario	.22
Quebec	.06
New Brunswick	.01
Prince Edward Island	.06
Nova Scotia	.28
Yukon	.03
Idaho	.03
Montana	.5
Wyoming	.64
Utah	.06
Arizona	.01
California	.06
Nevada	.01
Colorado	.03
New Mexico	.5
Oklahoma	.03
Arkansas	.03
Mississippi	.03
Alabama	.03
Georgia	.03
Florida	.03
South Carolina	.03
North Carolina	.03
Virginia	.03
West Virginia	.03
Kentucky	.03
Tennessee	.03
Missouri	.03
Illinois	.03
Indiana	.03
Ohio	.03
Pennsylvania	.03
Delaware	.03
Maryland	.03
District of Columbia	.03
Virginia	.03
North Carolina	.03
South Carolina	.03
Georgia	.03
Florida	.03
Alabama	.03
Mississippi	.03
Arkansas	.03
Louisiana	.03
Texas	.03
New Mexico	.03
Arizona	.03
California	.03
Nevada	.03
Idaho	.03
Montana	.03
Wyoming	.03
Utah	.03
Colorado	.03
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IN THE YEAR 1928 ABOUT 77 PER CENT OF THE TOTAL RECEIPTS OF BUTTER AT THE FOUR PRINCIPAL MARKETS, NEW YORK, BOSTON, CHICAGO, AND PHILADELPHIA, ORIGINATED IN FIVE STATES - MINNESOTA, IOWA, WISCONSIN, NEBRASKA, AND ILLINOIS. OVER 28 PER CENT CAME FROM MINNESOTA AND OVER 18 PER CENT FROM IOWA. ONLY RELATIVELY SMALL QUANTITIES ORIGINATED OUTSIDE THE NORTH-CENTRAL STATES. ROCKY MOUNTAIN AND PACIFIC COAST STATES SEND MOST OF THEIR SURPLUS BUTTER TO THE POPULATION CENTERS IN THE PACIFIC COAST STATES AND VERY LITTLE IS SHIPPED TO EASTERN MARKETS. (DATA FROM DIVISION OF DAIRY AND POULTRY PRODUCTS)

PER CAPITA CONSUMPTION OF DAIRY PRODUCTS IN THE UNITED STATES 1917-1929

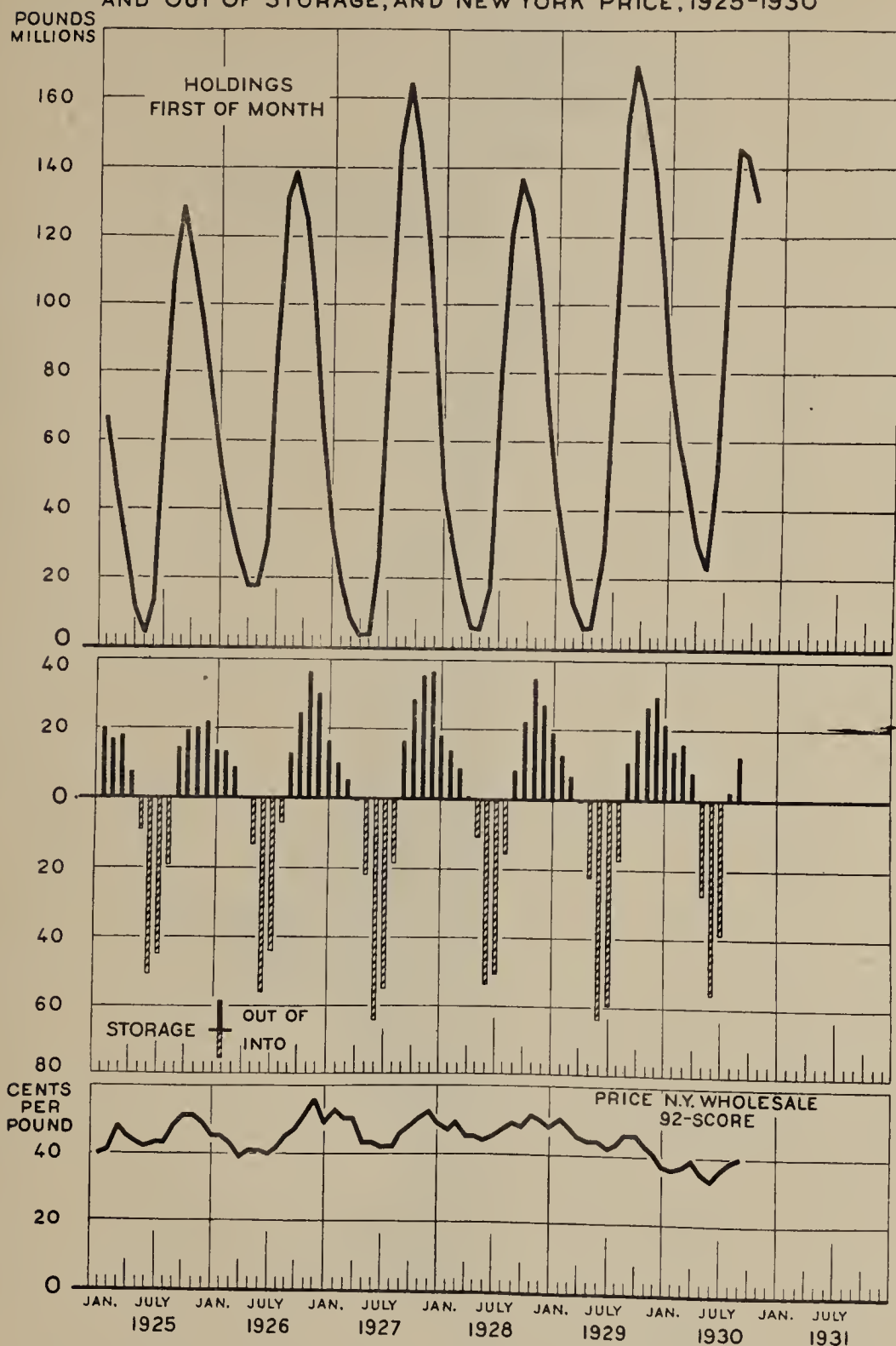


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NEG. 13721

THE PER CAPITA CONSUMPTION IN POUNDS OF DAIRY PRODUCTS IN THE UNITED STATES HAS INCREASED DURING THE LAST TEN YEARS. THE GREATEST INCREASE HAS OCCURRED IN WHOLE MILK CONSUMPTION, WITH CONDENSED MILK SECOND. PER CAPITA CONSUMPTION OF BUTTER AND ICE CREAM HAS BEEN GRADUALLY INCREASING SINCE THE WORLD WAR. FROM THE STANDPOINT OF THE DAIRY INDUSTRY IN GENERAL, THE PER CAPITA CONSUMPTION OF WHOLE MILK AND BUTTER ARE THE MOST IMPORTANT, AS OVER 80 PER CENT OF ALL MILK IS USED AS WHOLE MILK AND CREAM OR IS USED TO MAKE BUTTER. ICE CREAM, CHEESE, AND CONDENSED MILK, COMBINED, USE LESS THAN 15 PER CENT OF THE TOTAL WHOLE MILK SUPPLY. (DATA FROM DIVISION OF DAIRY AND POULTRY PRODUCTS)

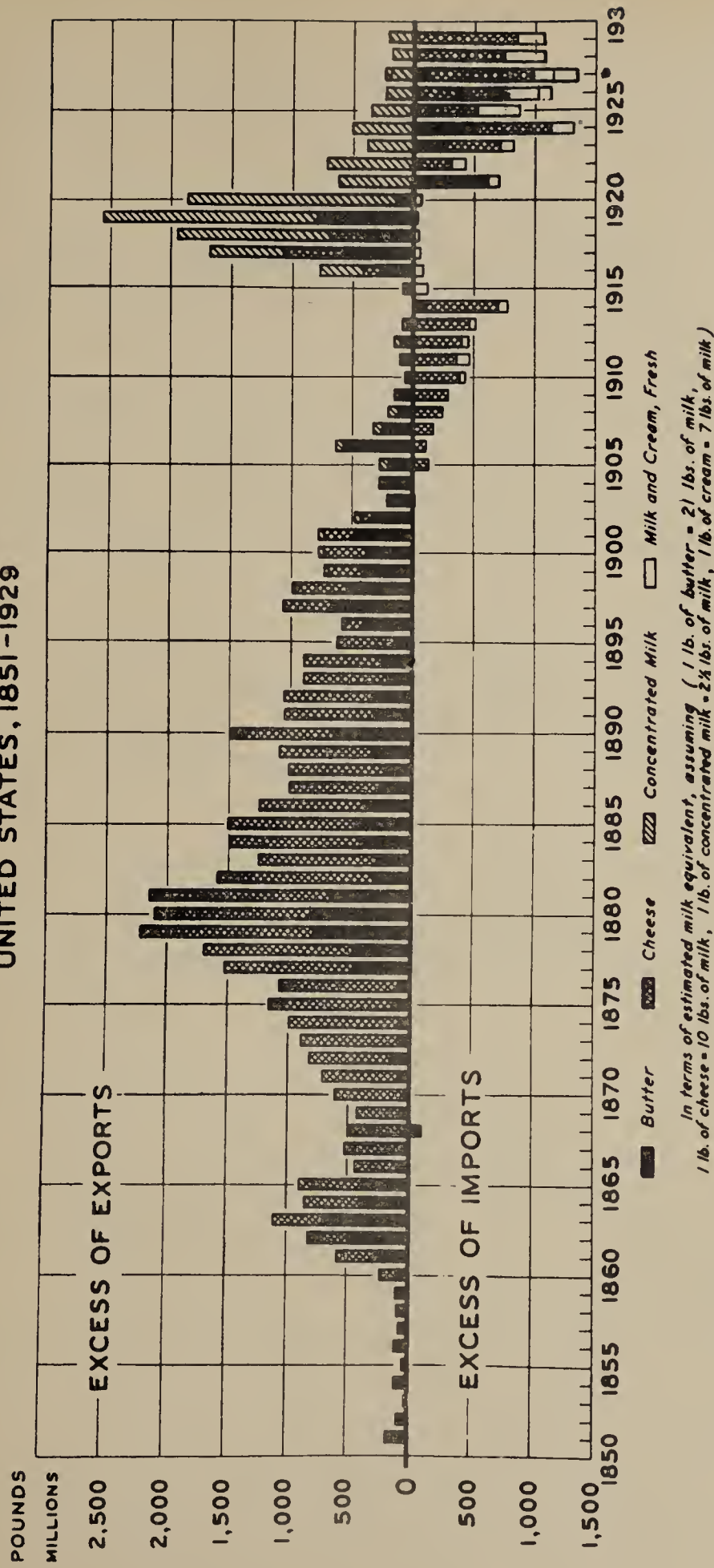
CREAMERY BUTTER: COLD-STORAGE HOLDINGS, NET MOVEMENT INTO AND OUT OF STORAGE, AND NEW YORK PRICE, 1925-1930



NEG. 18565

CREAMERY BUTTER USUALLY GOES INTO STORAGE DURING THE MONTHS OF MAY, JUNE, JULY, AND AUGUST - THE MONTHS OF GREATEST PRODUCTION. THE GREATEST WITHDRAWALS OCCUR USUALLY DURING THE MONTHS OF NOVEMBER AND DECEMBER, THE PERIOD OF LOW PRODUCTION. THE MARGIN BETWEEN SEASONAL LOW PRICES AND THE SEASONAL HIGH PRICES HAS BEEN DECREASING IN RECENT YEARS, THEREBY DECREASING THE CHANCES OF PROFIT IN COLD STORAGE OPERATIONS. (CALCULATED FROM DATA IN "CROPS AND MARKETS")

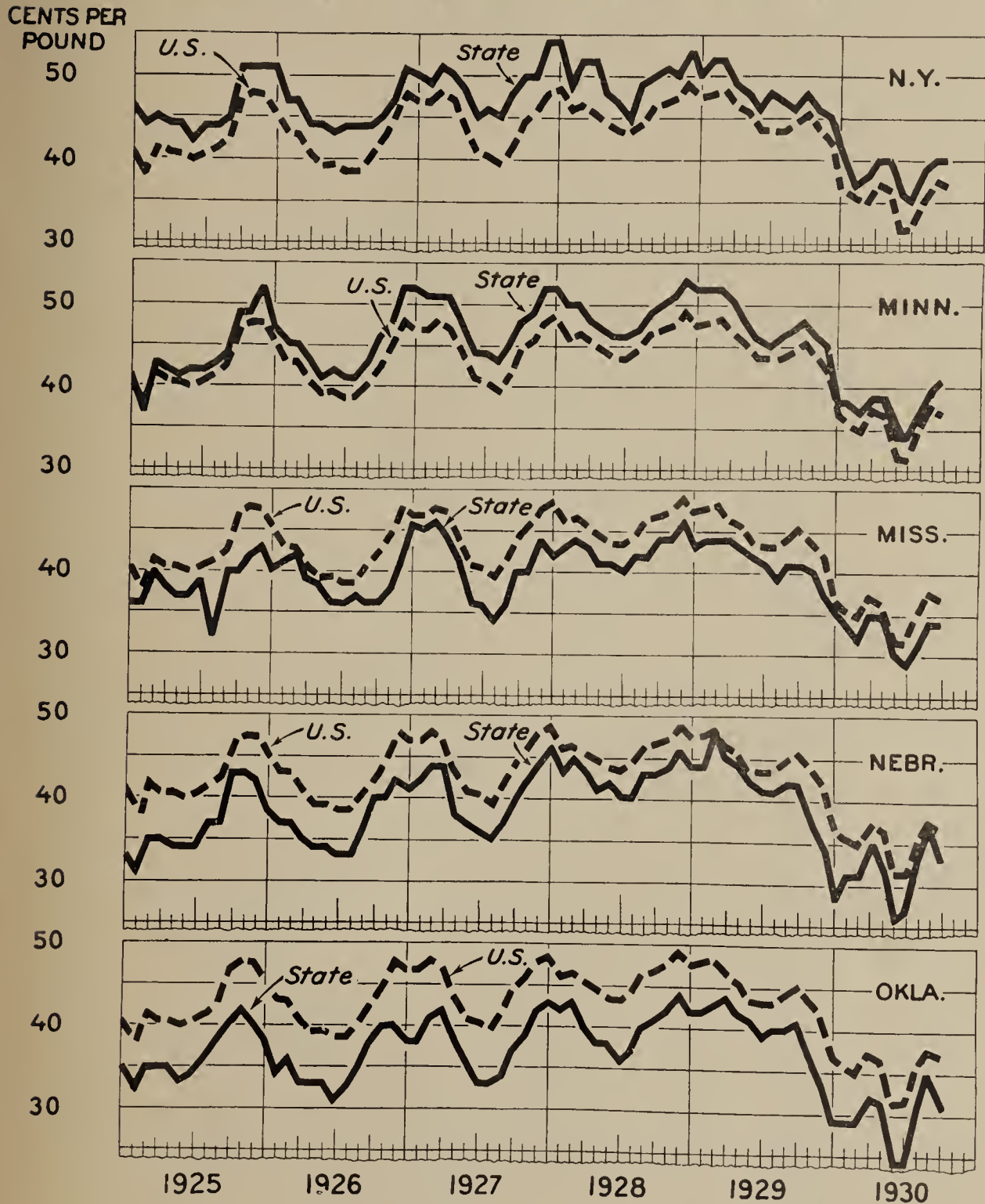
EXCESS OF EXPORTS OR IMPORTS OF DAIRY PRODUCTS UNITED STATES, 1851-1929



NEG. 11554

THE VOLUME OF EXPORTS OF DAIRY PRODUCTS REACHED THE PEAK AROUND 1880 WHEN OVER 2 BILLION POUNDS OF MILK WERE EXPORTED IN THE FORM OF CHEESE AND BUTTER. EXPORTS GRADUALLY DECREASED FROM 1881 UNTIL 1914 BUT LARGE QUANTITIES WERE EXPORTED DURING THE WORLD-WAR PERIOD. BETWEEN 1905 AND 1914 THE IMPORTATIONS OF CHEESE INCREASED. SINCE THE WORLD-WAR CONDENSED OR CONCENTRATED MILK HAS COMPRISED NEARLY ALL OF THE EXPORTS. SINCE 1925 THE IMPORTS OF DAIRY PRODUCTS HAVE BEEN COMPOSED MAINLY OF CHEESE, ALTHOUGH SOME WHOLE MILK AND SOME CREAM ARE IMPORTED INTO THE BORDER STATES NEAR THE LARGE CENTERS OF POPULATION. (DATA FROM DIVISION OF STATISTICAL AND HISTORICAL RESEARCH)

Prices to Producers of Butterfat in Selected States and the U. S.

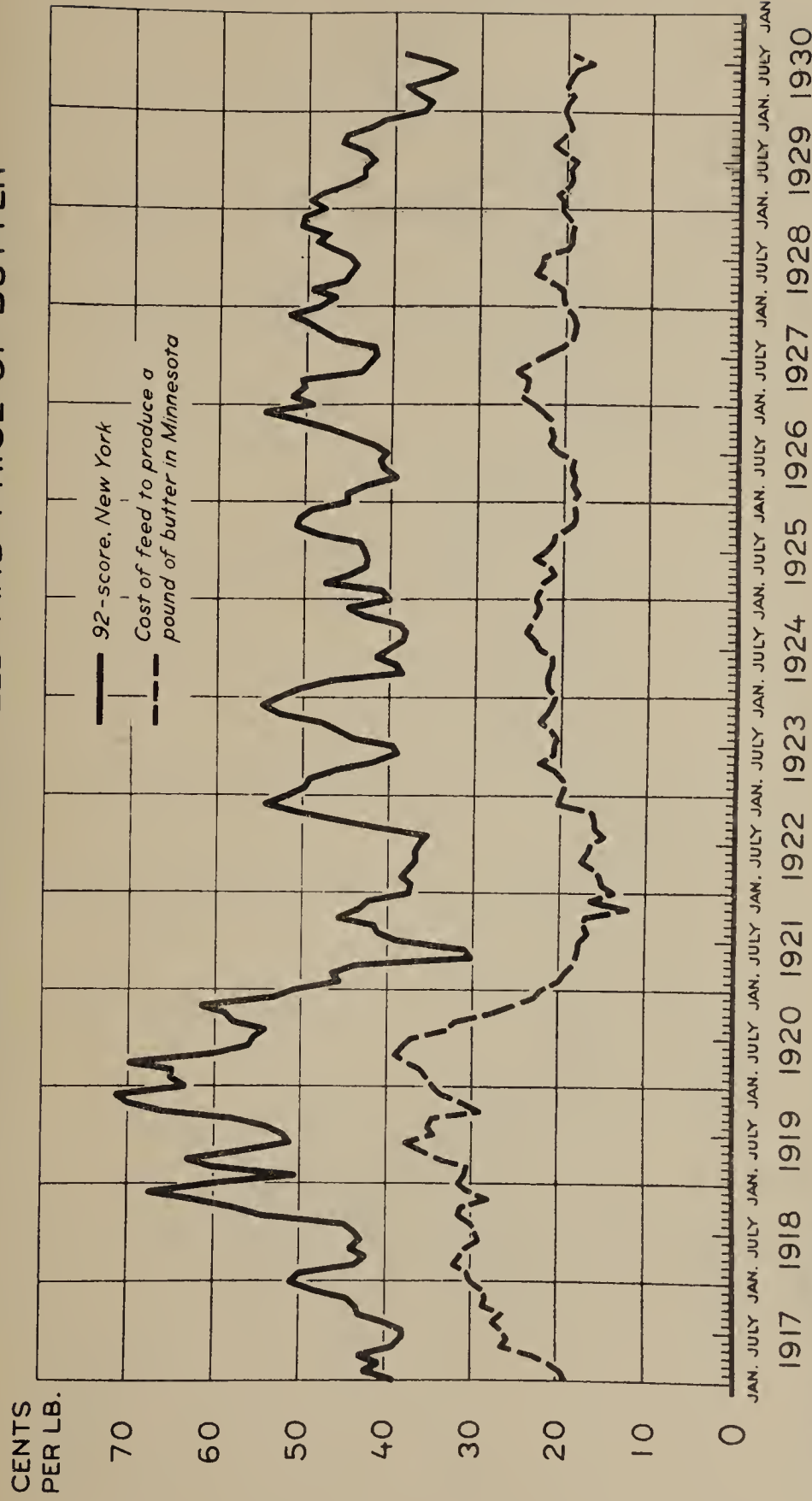


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NEG. 20679 BUREAU OF AGRICULTURAL ECONOMICS

PRICES TO PRODUCERS OF BUTTERFAT IN NEW YORK AND MINNESOTA, TWO IMPORTANT DAIRY-PRODUCING STATES, ARE HIGHER THAN THE AVERAGE FOR ALL STATES. PRICES TO PRODUCERS IN MISSISSIPPI, NEBRASKA, AND OKLAHOMA, AS REPRESENTATIVE OF DIFFERENT PRODUCING CONDITIONS, ARE LOWER THAN THE UNITED STATES AVERAGE. THE SEASONAL TRENDS IN ALL STATES ARE SIMILAR. (DATA FROM "CROPS AND MARKETS")

SPREAD BETWEEN COST OF FEED AND PRICE OF BUTTER



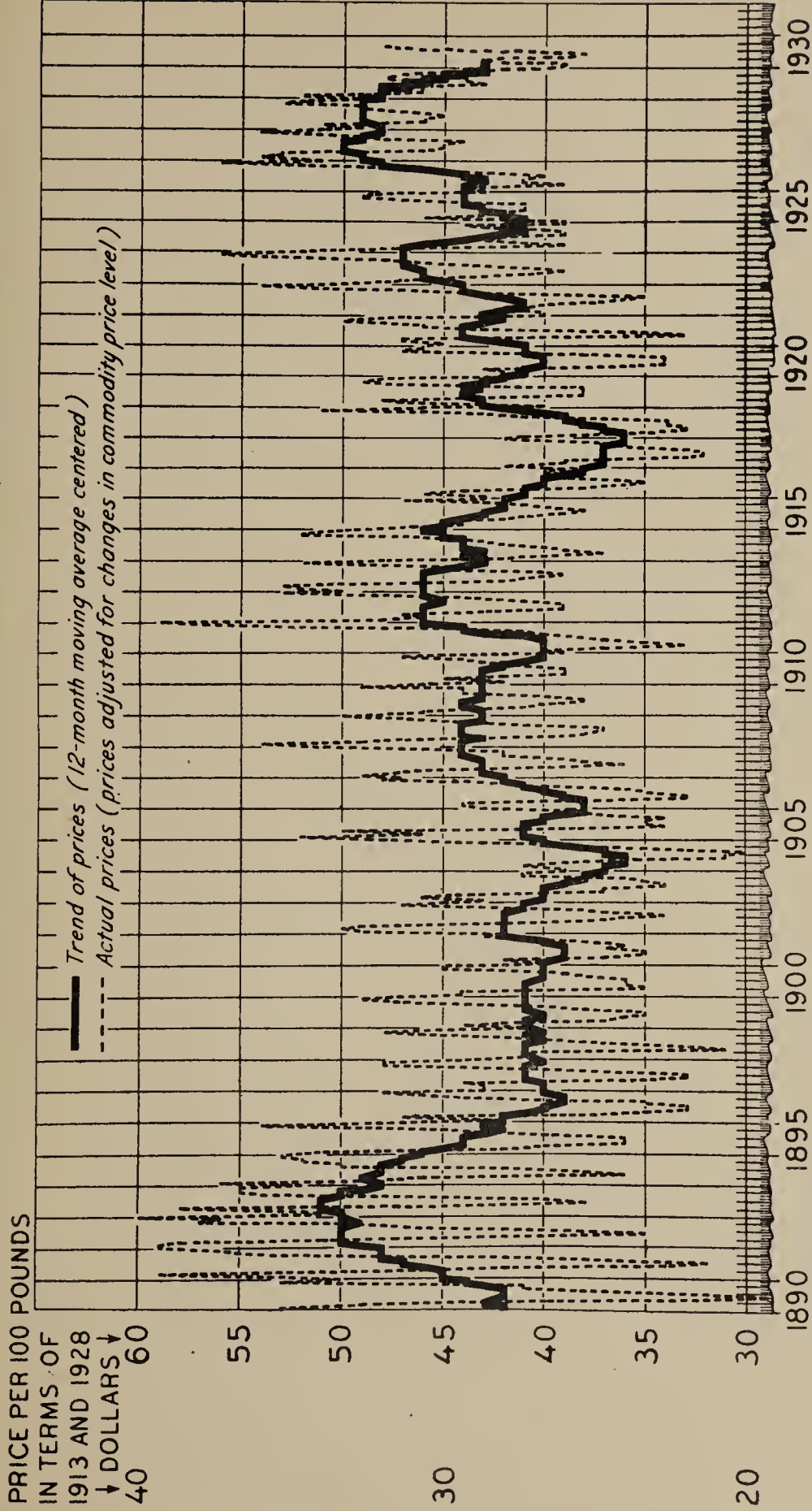
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BUREAU OF AGRICULTURAL ECONOMICS

NEG. 10910

ONE OF THE PRINCIPAL COSTS OF PRODUCING BUTTER IS THE COST OF FEED TO THE MILK COWS. IF FEED COSTS ARE HIGH THE CHANCES FOR PROFIT ARE LESSENED, AND VICE VERSA. THROUGH A PERIOD OF YEARS THE TREND IN THE PRICE OF BUTTER IS SIMILAR TO THE TREND IN FEED COSTS. THE PRICE OF BUTTER CHANGES GREATLY FROM ONE SEASON TO ANOTHER, BUT FEED COSTS ARE MORE STABLE. IN MINNESOTA FEED COSTS USUALLY TEND TO BE LOWER IN THE FALL MONTHS, THE SEASON OF RELATIVELY CHEAP GRAINS, AND MOVE A LITTLE HIGHER TOWARDS THE SPRING MONTHS. SINCE THE WINTER OF 1926 THE PRICE OF BUTTER AT NEW YORK HAS TENDED DOWNWARD, AS HAS THE COST OF FEED TO PRODUCE BUTTER IN MINNESOTA. (DATA FROM DIVISION OF DAIRY AND POULTRY PRODUCTS)

PRICES OF BUTTER AT NEW YORK, 1890-1930



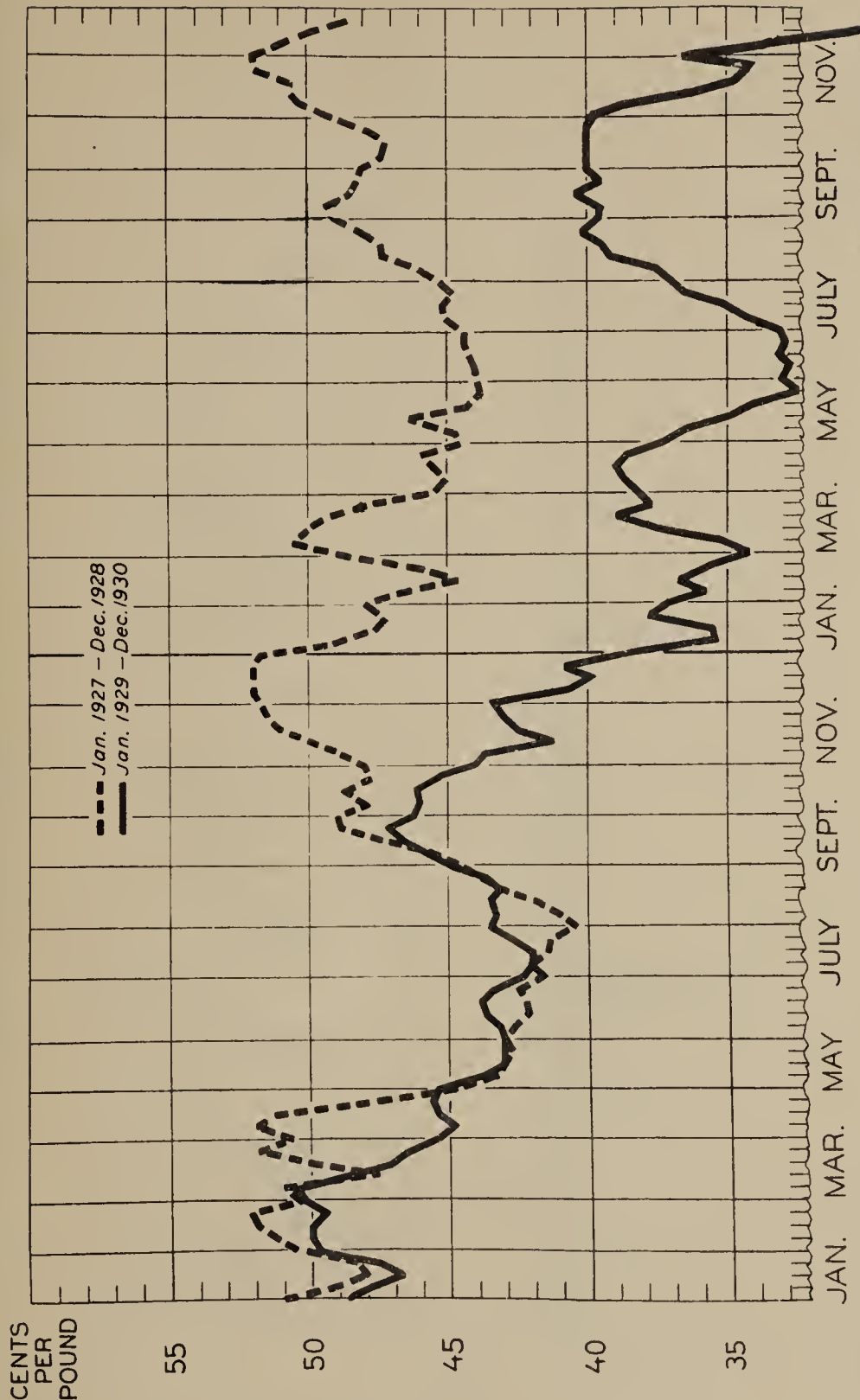
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NEG. 20137

THIS CHART SHOWS THE ACTUAL PRICES OF BUTTER AT NEW YORK ADJUSTED FOR CHANGES IN THE ALL-COMMODITY PRICE LEVEL (DASHED LINE) AND THE TREND OF THESE ADJUSTED PRICES (HEAVY LINE) FOR THE PERIOD 1890 TO 1929. THE TREND OF BUTTER PRICES, AS INDICATED BY THE BLACK LINE, TENDS TO MOVE EITHER UPWARD OR DOWNWARD FROM ONE YEAR TO THE NEXT. THE LEVEL OF ADJUSTED PRICES FOR 1927 AND 1928 WAS THE HIGHEST SINCE 1895, BUT FOR 1929 AND 1930 A DECREASE IN THE LEVEL OF PRICES TOOK PLACE. (DATA FROM DIVISION OF STATISTICAL AND HISTORICAL RESEARCH)

BUTTER, 92-SCORE: PRICE PER POUND AT NEW YORK, BY WEEKS



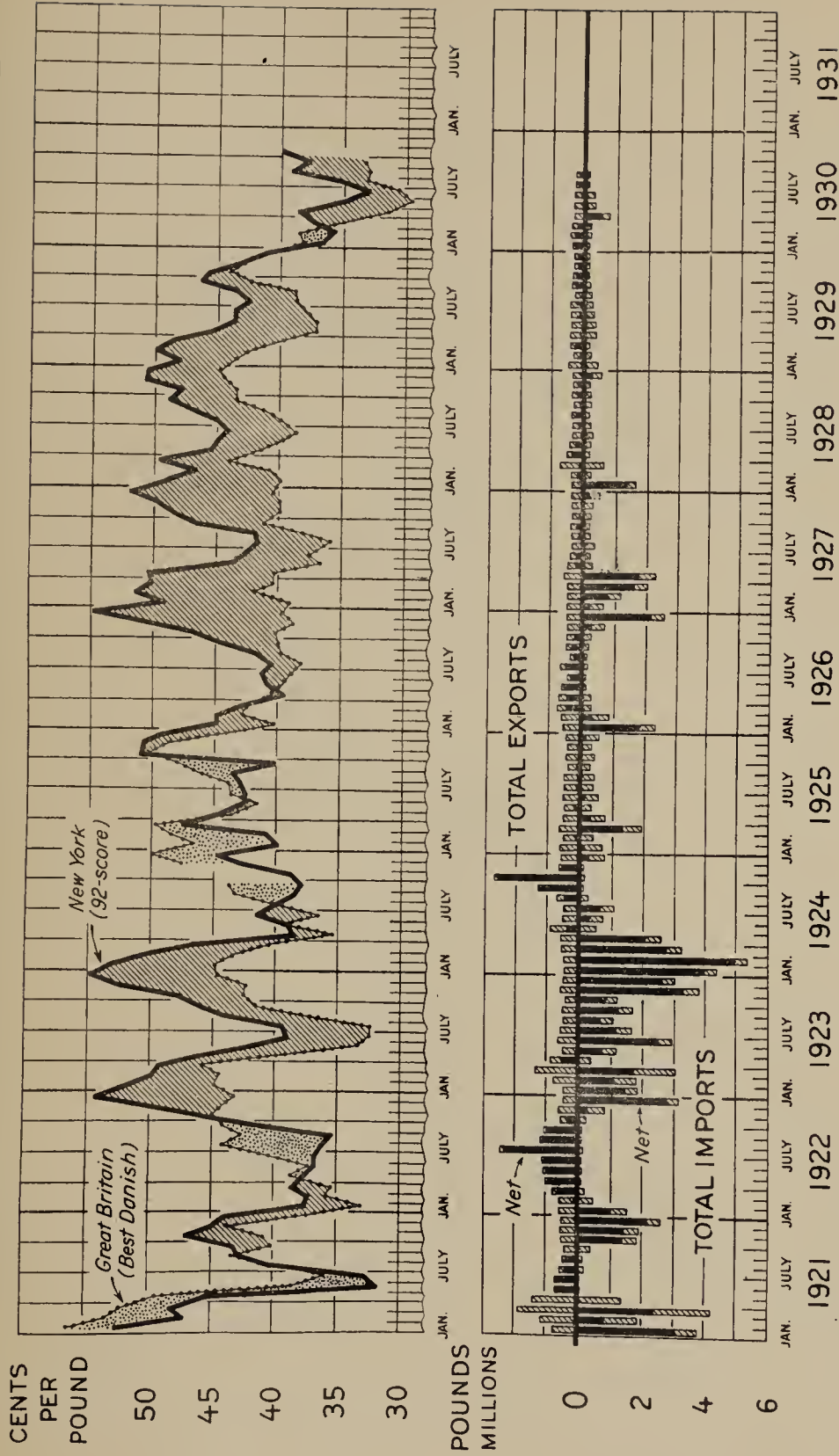
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NEG. 20958

THIS CHART ILLUSTRATES THE DECLINE WHICH HAS TAKEN PLACE IN BUTTER PRICES SINCE THE MIDDLE OF SEPTEMBER, 1929. AT THAT TIME THE USUAL SEASONAL RISE FAILED TO TAKE PLACE AND THE TREND WAS SHARPLY DOWNWARD UNTIL JUNE 1930. DURING JULY AND AUGUST THE PRICE STRENGTHENED, BUT DURING NOVEMBER AND DECEMBER IT DROPPED TO NEW LOW LEVELS. THE NORMAL SEASONAL TREND IS ILLUSTRATED BY THE UPPER DASHED LINE SHOWING THE PRICES PREVAILING DURING 1927 AND 1928. (DATA FROM DIVISION OF DAIRY AND POULTRY PRODUCTS)

MONTHLY AVERAGE PRICES OF BUTTER IN GREAT BRITAIN AND NEW YORK AND TOTAL MONTHLY IMPORTS AND EXPORTS OF BUTTER INTO THE U.S., JAN. 1921 TO DATE



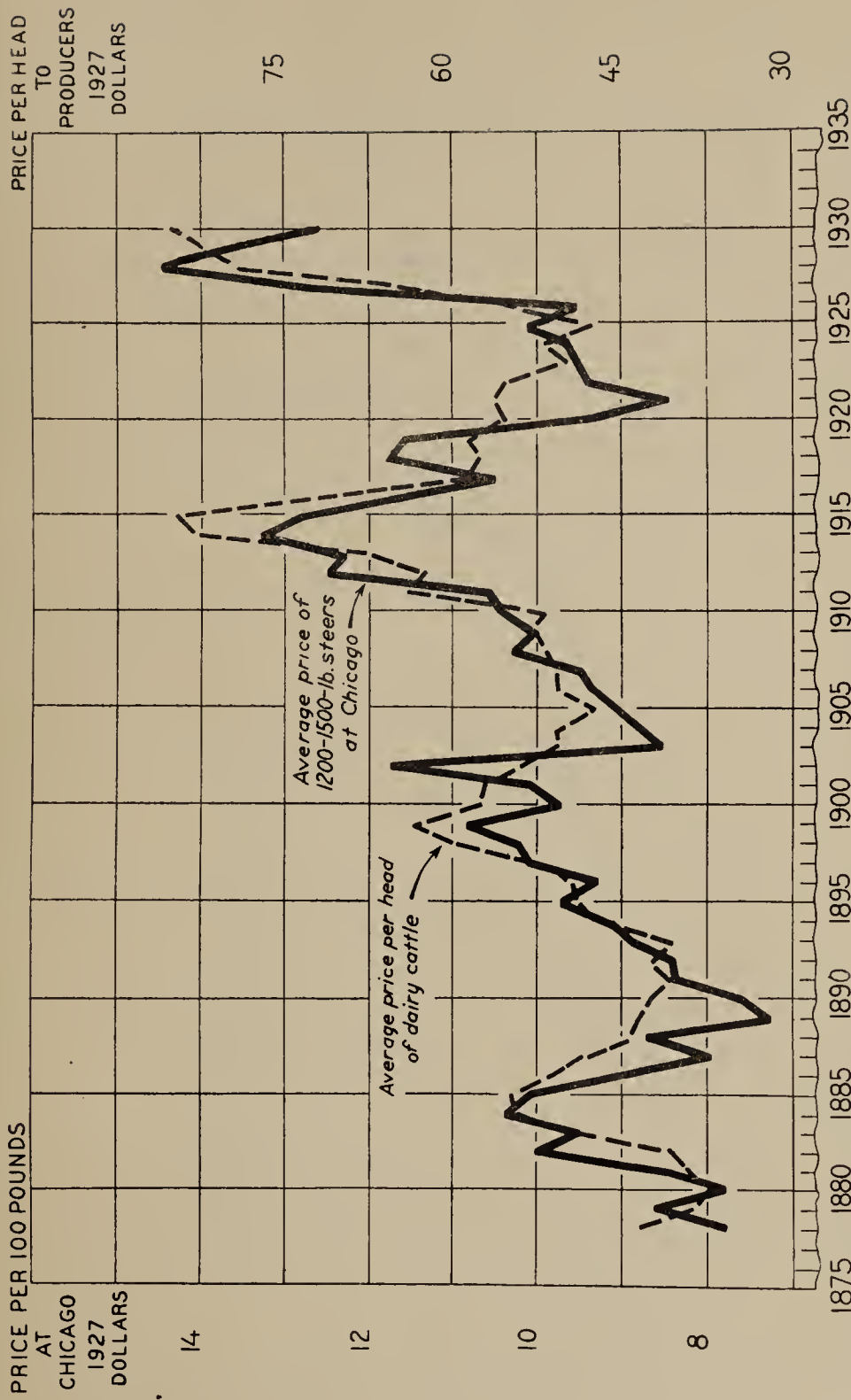
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BOTH IMPORTS AND EXPORTS OF BUTTER ARE OF COMPARATIVELY MINOR IMPORTANCE IN THE BUTTER-PRICE SITUATION IN THE UNITED STATES. THE LOWER PART OF THIS CHART INDICATES THAT SINCE 1924 LESS THAN ONE MILLION POUNDS HAS BEEN EXPORTED IN ANY MONTH, AND LESS THAN 3 MILLION POUNDS HAS BEEN IMPORTED IN ANY MONTH. BEFORE THE PRESENT TARIFF OF 14 CENTS PER POUND ON BUTTER IMPORTED INTO THE UNITED STATES WAS IN EFFECT, THE SPREAD PREVAILING BETWEEN THE NEW YORK PRICE AND THE PRICE IN GREAT BRITAIN WAS A FACTOR OF GREAT INFLUENCE ON IMPORTS. BUTTER PRODUCTION IN THE UNITED STATES IS ABOUT EQUAL TO BUTTER CONSUMPTION IN THE UNITED STATES. (DATA FROM DIVISION OF STATISTICAL AND HISTORICAL RESEARCH)

NEG. 14567

U.S. PRICE OF DAIRY CATTLE AND PRICE OF STEERS AT CHICAGO



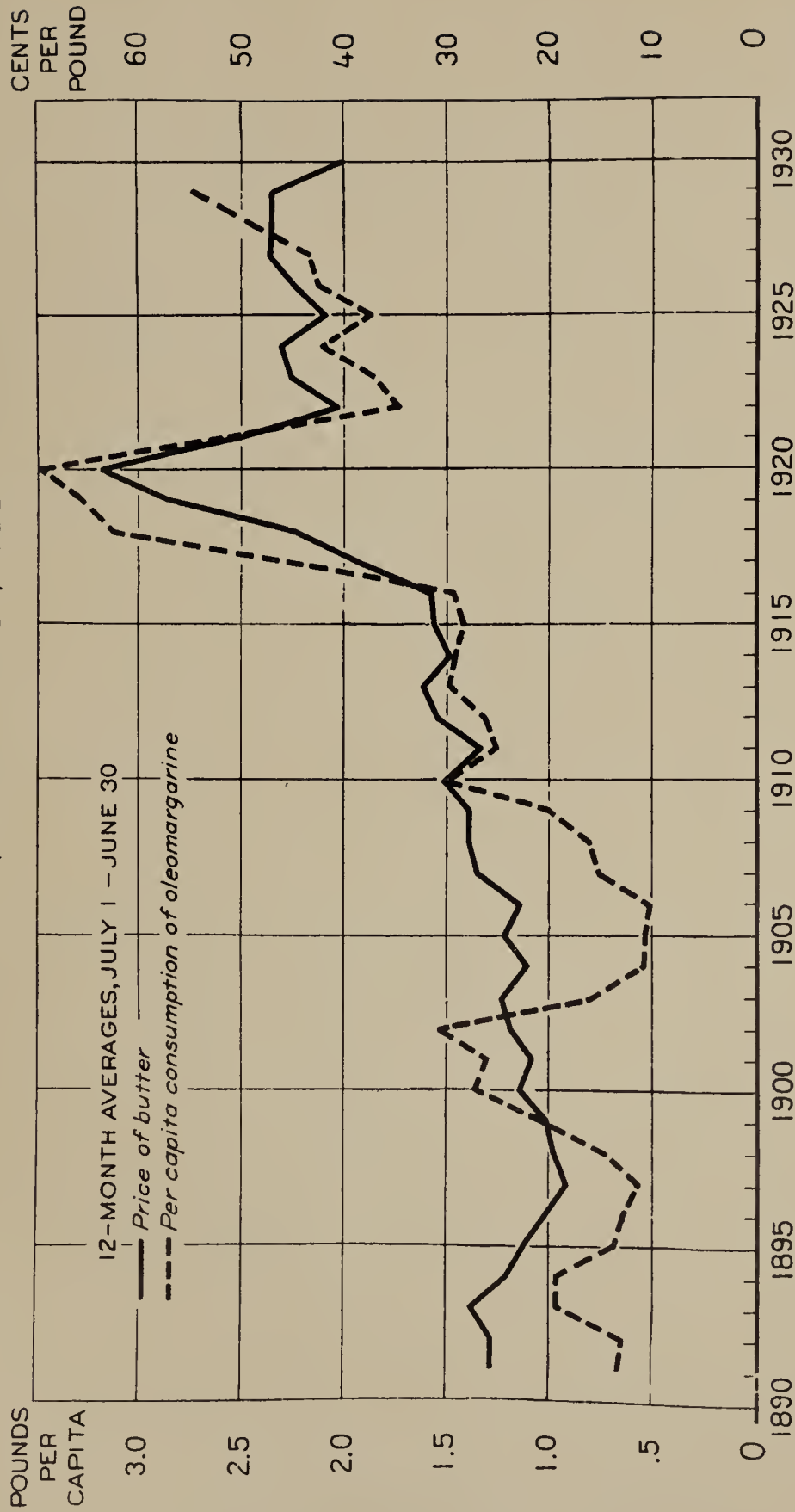
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NEG. 18764

DAIRY PRODUCTION AND BEEF PRODUCTION ARE CLOSELY RELATED FARM ENTERPRISES IN MANY AREAS, EXCEPT IN SPECIALIZED DAIRY SECTIONS, SUCH AS OCCUR IN WISCONSIN AND NEW YORK. THE TYPE OF COW USED FOR DAIRY PURPOSES IS IN MANY CASES ADAPTABLE TO BEEF PRODUCTION. THIS IS ESPECIALLY TRUE IN THE CORN BELT WHERE THE SAME HERD OF COWS MAY PRODUCE BEEF FOR SLAUGHTER AND LARGE QUANTITIES OF MARKET MILK. THE AVERAGE UNITED STATES PRICE OF DAIRY CATTLE ON FARMS AND THE PRICE OF STEERS AT CHICAGO THEREFORE HAVE APPROXIMATELY THE SAME LONG-TIME FLUCTUATIONS, THE FARM PRICE OF DAIRY CATTLE TENDING TO LAG BEHIND THE PRICE OF BEEF CATTLE. (DATA FROM "CROPS AND MARKETS")

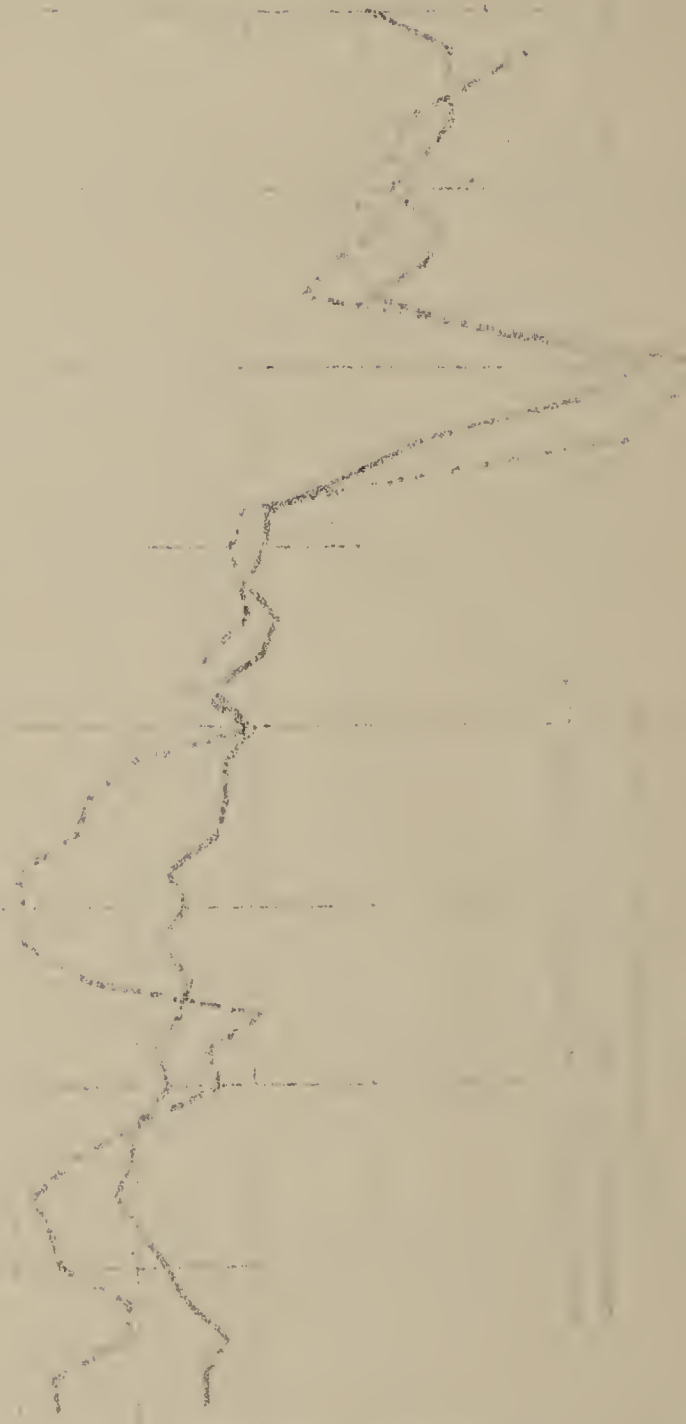
PRICE OF BUTTER AND CONSUMPTION PER CAPITA OF OLEOMARGARINE JULY 1, 1891 - JUNE 30, 1930



U.S. DEPARTMENT OF AGRICULTURE

NEG. 18985 BUREAU OF AGRICULTURAL ECONOMICS

THE PRINCIPAL COMPETITOR OF BUTTER IN CONSUMPTION IS OLEOMARGARINE. WHEN BUTTER IS RELATIVELY HIGH IN PRICE, CERTAIN CLASSES OF CONSUMERS OF LOW INCOME BUY OLEOMARGARINE IN PLACE OF BUTTER, AND THE PER CAPITA CONSUMPTION OF OLEOMARGARINE RISES AND FALLS MUCH AS DOES THE PRICE OF BUTTER. IN RECENT YEARS THE PRODUCTION OF OLEOMARGARINE HAS BEEN ABOUT 20 PER CENT OF THE PRODUCTION OF CREAMERY BUTTER IN THE UNITED STATES. AN INTERNAL REVENUE TAX OF 10 CENTS PER POUND PREVAILS ON COLORED OLEOMARGARINE, BUT THERE IS NO TAX ON UNCOLORED. RELATIVELY HIGH PRICES OF BUTTER HAVE LED TO A HIGHER CONSUMPTION OF OLEOMARGARINE SINCE THE WORLD WAR. (DATA FROM DEPARTMENT YEARBOOK)



of agricultural economics.
for the dairy industry and
national dairy program.
products outlook program.

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